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SURE-FIRE WAYS TO AVOID WORKSHEET ERRORS

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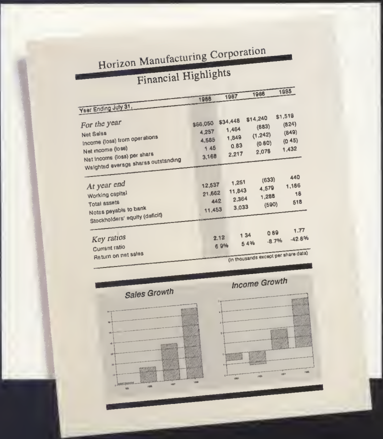

Horizon Manufacturing Corporation

Financial Highlights

Year Ending July 31,	1988	1987	1986	1985
For the year				
Net Sales	$66,050	$34,448	$14,240	$1,518
Income (loss) from operations	4,257	1,464	(683)	(824)
Net income (loss)	4,585	1,849	(1,242)	(849)
Net income (loss) per share	1 45	0 83	(0 80)	(0 45)
Weighted average shares outstanding	3,168	2,217	2,076	1,432
At year end				
Working capital	12,537	1,251	(633)	440
Total assets	21,662	11,843	4,579	1,166
Notes payable to bank	442	2,364	1,288	16
Stockholders' equity (deficit)	11,453	3,033	(590)	518
Key ratios				
Current ratio	2.12	1 34	0 89	1.77
Return on net sales	6 9%	5 4%	-8.7%	-42 8%

(in thousands except per share data)

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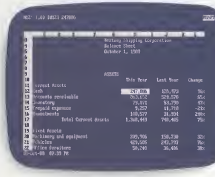

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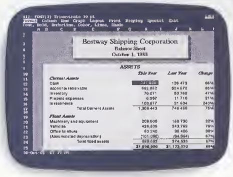

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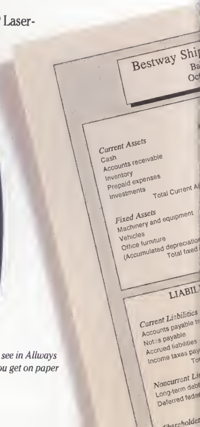

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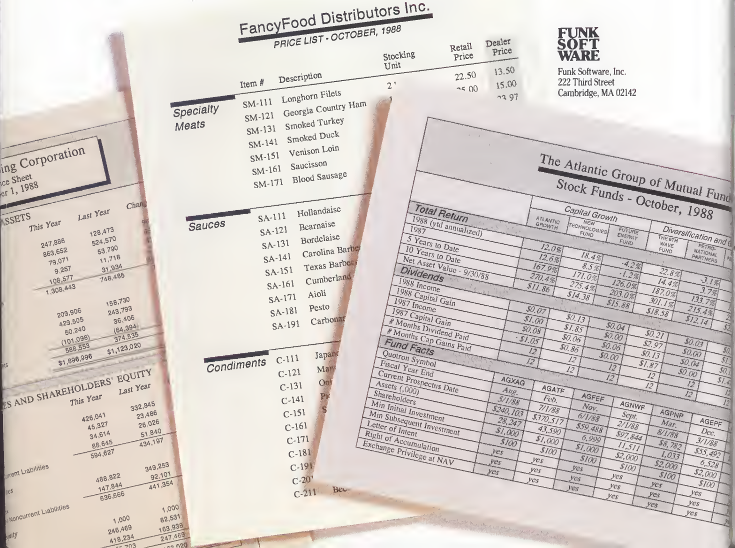

FancyFood Distributors Inc.

PRICE LIST - OCTOBER, 1988

	Item #	Description	Stocking Unit	Retail Price	Dealer Price
Specialty Meats	SM-111	Longhorn Filets	2	22.50	13.50
	SM-121	Georgia Country Ham			15.00
	SM-131	Smoked Turkey			
	SM-141	Smoked Duck			
	SM-151	Venison Loin			
	SM-161	Saucisson			
	SM-171	Blood Sausage			
Sauces	SA-111	Hollandaise			
	SA-121	Bearnaise			
	SA-131	Bordelaise			
	SA-141	Carolina Barbe			
	SA-151	Texas Barbe			
	SA-161	Cumberland			
	SA-171	Aioli			
	SA-181	Pesto			
	SA-191	Carbonar			
Condiments	C-111	Japane			
	C-121	Ma			
	C-131	On			
	C-141	P			
	C-151	S			
	C-161				
	C-171				
	C-181				
	C-191				
	C-20				
	C-211	Be			

ing Corporation
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SSETS	This Year	Last Year	Chan
	247,886	128,473	
	863,652	524,570	
	79,071	53,790	
	9,257	11,718	
	108,577	31,934	
	1,308,443	748,485	
	209,906	158,730	
	429,505	243,793	
	50,240	36,406	
	(101,098)	(64,394)	
	588,553	374,535	
ts	$1,896,996	$1,123,020	

ES AND SHAREHOLDERS' EQUITY	This Year	Last Year
	426,041	332,845
	45,327	23,486
	34,614	26,026
	88,645	51,840
	594,627	434,197
urrent Liabilities	488,822	349,253
ties	147,844	92,101
	636,666	441,354
x		
Noncurrent Liabilities	1,000	1,000
	246,469	82,531
quity	418,234	163,938
		247,469

The Atlantic Group of Mutual Fund

Stock Funds - October, 1988

	Capital Growth			Diversification and		
	ATLANTIC GROWTH	NEW TECHNOLOGIES FUND	FUTURE ENERGY FUND	THE 9TH WAVE FUND	PETRO-NATIONAL PARTNERS	
Total Return						
1988 (ytd annualized)	12.0%	18.4%	-4.2%	22.8%	-3.1%	
1987	12.6%	8.5%	-1.2%	14.4%	3.7%	
5 Years to Date	167.9%	171.0%	126.0%	187.0%	133.7%	
10 Years to Date	270.4%	275.4%	203.0%	301.1%	215.4%	
Net Asset Value - 9/30/88	$11.86	$14.38	$15.88	$18.58	$12.14	
Dividends						
1988 Income	$0.07	$0.13	$0.04	$0.21	$0.03	
1988 Capital Gain	$1.00	$1.85	$0.00	$2.97	$0.00	
1987 Income	$0.08	$0.06	$0.06	$0.13	$0.04	
1987 Capital Gain	$1.05	$0.86	$0.00	$1.87	$0.00	
# Months Dividend Paid	12	12	12	12	12	
# Months Cap Gains Paid	12	12	12	12	12	12
Fund Facts						
Quotron Symbol	AGXAG	AGATF	AGFEF	AGNWF	AGPNP	AGEPF
Fiscal Year End	Aug.	Feb.	Nov.	Sept.	Mar.	Dec.
Current Prospectus Date	5/1/88	7/1/88	6/1/88	2/1/88	8/1/88	3/1/88
Assets (,000)	$240,103	$370,517	$59,488	$97,844	$8,782	$55,492
Shareholders	28,247	43,590	6,999	11,511	1,033	6,528
Min Initial Investment	$1,000	$1,000	$1,000	$2,000	$2,000	$2,000
Min Subsequent Investment	$100	$100	$100	$100	$100	$100
Letter of Intent	yes	yes	yes	yes	yes	yes
Right of Accumulation	yes	yes	yes	yes	yes	yes
Exchange Privilege at NAV	yes	yes	yes	yes	yes	yes

LOTUS

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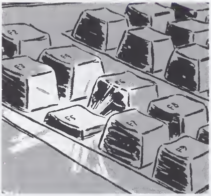

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STAFF LETTER

WHY AND HOW WE DO OUR REVIEWS

If you haven't taken a critical look at our Reviews section lately, I urge you to do so. Dick Ridington, our Resources section editor, and Mark Scapicchio, who joined us last August as assistant editor, have been working hard to make that section more useful.

The aim of our reviews is to help you make good decisions about new business software. Many other computer-oriented magazines have the same avowed aim. And some of them have a lot more space for the job.

So a reasonable question is, What do we bring to the party?

The obvious answer is, Our unique focus. We run the Reviews section with the knowledge that you use *1-2-3* or *Symphony*.

Not surprisingly, that means we take a hard look at any worthwhile *1-2-3* or *Symphony* add-in. But we don't stop there. We consider the kinds of work you do and the other types of software you use. We know that not all of you are big readers of computer magazines. So we try to help you, too, with graphics, communications, word processing, database management, project management, and other tasks.

And we are selective. With the help of outside experts, we sift through new programs and review only those that seem to challenge the existing front-runners—in functionality or in price-performance—or that seem to break new ground.

Our reviews are unique in other key ways. Where possible, we assign reviewers who use PCs in business and who use, or might want to use, a program like the one they are evaluating. A good example is Tom Carlton, manager of business analysis for a midwestern Fortune 500 company. With help from reviewers like Tom, we devise realistic tests based not on performance benchmarks but on functionality, reliability, and ease of learning and use.

We do not review a program in isolation. We often do a comparative review of two or more programs. Even when we single out a program for review, we compare it with other programs—either industry standards or programs we have already reviewed.

You can see the comparative approach clearly in this issue. Tom Carlton compares two *1-2-3* add-ins that do Monte Carlo simulations (page 92), and he also puts them into perspective by contrasting them with a program he reviewed in December. In his accompanying review of a new collection of add-in tools, he compares each tool with a leader in that category.

We recognize that we cannot make decisions for you. A program that falls short in a significant way may, because of its other strengths, still be the best one for your job. We try to clarify the trade-offs. In the Monte Carlo review, for example, Carlton points out that if you don't like having to exit from *1-2-3* to display the results of your risk analysis, you may prefer the program that is otherwise second best.

In all of this, we think we're on the right track. But we'd be pleased to hear what you think.

John B. Campbell
Editorial Director

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LETTERS

MORE WAYS TO AVOID THE FORMAT CATASTROPHE

In the article "Batch Files...Not Just for Experts" [October], Larry Roshfeld recommends creating a batch file called FORMAT.BAT, designed to format a disk in drive A when you type *format* without specifying a drive. This is terrible advice for a person who uses a private machine and for people in a business environment. Once you get accustomed to typing only *format* to format drive A, you can wipe out the hard disk on any other system you use. It is much safer when you're required to specify the drive you want to format.

Fortunately, recent versions of DOS have almost eliminated the accidental format problem. But while it's fine to prevent someone from giving a command that has disastrous consequences, you must never encourage anyone to give commands that could be disastrous on another machine.

Robert E Brown, President
Landmark Software
Sunnyvale, Calif

Larry Roshfeld's batch file ideas are good, especially for those who don't have access to a PC guru to help them set up their system. However, rather than stop with renaming FORMAT.COM and creating a batch file to do the dirty work, I recommend that you strike FORMAT.COM from your hard disk, move it to a write-protected floppy disk, and give it a label something like FORMAT.COM—DANGEROUS.

A batch file is fine for someone who's careful with keystrokes and wants to format a new floppy disk without doing a lot of typing to start it up. It's when you're rushed, the boss is on your neck, the phone rings, and the dog's chewing the power cord that you're likely to be visited by Mr. Murphy. If FORMAT.COM isn't there, he may not even find your neighborhood.

Mike Ossing
Columbus, Ohio

In our company, the use of double-density disks with high-density A drives sometimes necessitates the use of the FORMAT A:/4 command as well as FORMAT A:.

Rather than build a separate batch file for each parameter and switch, we renamed the FORMAT.COM file to KILLDISK.COM as suggested, then created the following FORMAT.BAT file:

```
echo off
if %1= =c: goto stop
if %1= =C: goto stop
killdisk.com %1 %2
goto end
:stop
echo Format of c: not allowed!!!
:end
```

This batch file works for any parameter with the exception of c: or C:.

Steve Freeman, Coordinator-MIS
Anchor Pad International
Ventura, Calif

Our office runs a number of applications on our hard-disk system. To speed access to the various programs, we set up batch files as Roshfeld suggests, using mnemonically coded batch file names. However, we have added two features that readers may find handy.

First, AUTOEXEC.BAT includes the following statements:

```
cls
type menu.dat
```

The first command clears the screen, and the second command brings up a menu that shows the mnemonic batch-file name and the corresponding application. For example:

```
D DOS
L LOTUS
M MULTIMATE
```

The screen also displays the message *Enter selection and press enter.* This lets you call a batch file to bring up the application.

In addition, we created a file named MENU.BAT that just clears the screen and brings up the menu of mnemonic batch-file names and their applications.

Each of the batch files that calls an application ends with the statement *cd c:* so that when you exit from the application program, the system returns to the root directory from which the file MENU.BAT or the other applications can be called.

Mark C Anderson, Refinery Manager
Trifinery
Corpus Christi, Tex

Author's note: *I am grateful to Mr. Brown for raising an extremely valid point. It is wise to consider possible "disastrous consequences" in any environment where a novice may use someone else's PC. On a related note, consider also the dangers of training people to use shortcuts without first giving them a solid understanding of the basics of the PC and DOS. If a novice relies on a set of customized batch files, what will happen when he or she uses a PC that doesn't support the shortcuts? Batch files do not replace proper training in the fundamentals of PC use.*

Mr. Ossing raises an issue with which all PC users must struggle. Where do we draw the line between convenience and potential danger? If we remove the FORMAT command from the hard disk entirely, we decrease the likelihood of damage, but we also make it inconvenient to use a new floppy disk.

Mr. Freeman's approach takes advantage of the ability to pass variables to a batch file from the DOS prompt. This feature, not discussed in my article, is a very powerful way to create dynamic batch applications. Warning: This batch file does not check for the lack of a drive specification.

Mr. Anderson's suggestion is a good one for using batch files to extend the customization of DOS. The menu screen approach that he describes can be as simple or as complex as you wish.

WHO'S TO BLAME FOR OS/2?

Richard Cranford's "Diary of an Early OS/2 User" [September] reminds me of Leo Rosten's definition of *chutzpah* as the quality shown by a man who murders his parents and then asks for mercy on the grounds that he is an orphan.

For years the PC industry has been inflicting copy protection and other perverse techniques on the hapless consumer. Although these harebrained schemes were intended to prevent illegal copying, they don't even slow the pirates down. They do, however, inconvenience or sabotage the legitimate user. Typically, these schemes cause problems when you have to restore lost data to your hard disk, replace your media, upgrade your processor, or install new software.

Now Lotus has fallen victim to its own booby trap, and what happens? Instead of shamefacedly saying "Mea culpa, mea culpa, mea maxima culpa!" when *Symphony* 2.0 won't run in the OS/2 compatibility box, you try to place the blame on Microsoft.

Seymour J. Metz
Annandale, Va

Author's note: *I am not, nor is* LOTUS *magazine, the voice of Lotus Development Corp. When I complained about the way a Lotus product interacted with OS/2, I was not blaming Microsoft, but recording my frustrations as I took OS/2 out for a spin.*

As far as I can tell, Symphony *Release 2.0 does run in the OS/2 compatibility box. However, you cannot initialize* Symphony's *System Disk from the compatibility box, at least not the 3½-inch disk.*

For the record, Lotus Development Corp. does not claim that Symphony *Release 2.0 runs problem-free in the OS/2 compatibility box. The important question here is whether OS/2 is a superset of DOS. If you can do even one thing with DOS that you can't do with the OS/2 compatibility box, then OS/2 is* not *a true superset of DOS.*

LET'S HAVE MORE COLOR

EGA and VGA have done wonders for graphics. Now it's time to get some of those beautiful (and informative) colors onto the spreadsheet.

1-2-3 currently displays protected cells as white on black and unprotected cells as green on black, but only when there's something in the cell. Lotus should expand this useful technique by offering additional ways to display colors on a spreadsheet, colors that indicate range and function.

Global colors should be changeable. The default could be white on black, but the user should be able to change it. I may use white on black to indicate a rough draft or a template still being developed, and then change it to white on blue for an income statement or white on red for an expense report. Just being able to change background colors from time to time would help relieve eye strain, fatigue, and the accompanying input errors.

Ranges could be colored to indicate notes, comments, warnings, input areas, output areas, related cells, or different areas of a very large spreadsheet. Alternate rows or columns could be colored, much like the green or blue bars on computer paper.

@Functions should be developed to change the individual cell colors also. Can you imagine the value of a function that displayed negative numbers as red on black, or amounts over budget as black on red, or errors as a flashing yellow ERR?

If the user has a color printer, the spreadsheet could even print in colors. Picture an accounting report with real red ink, just like the good old days!

Jim Robison
Senior Buyer
ComputerLand Corp
Hayward, Calif

Editor's note: *We passed along your suggestions.*

Letters to the editor should be sent to Letters Editor, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123. Letters may be edited for length and clarity.*

@ERR

In the Ideas & Trends article "Microsoft and IBM Enhance DOS" (October), we said that until April 28, 1989, owners of previous DOS versions can upgrade to DOS 4.0 for $95. This upgrade is available only to owners of IBM versions of DOS (PC-DOS), not to owners of Microsoft's version (MS-DOS). Microsoft sells MS-DOS only to original equipment manufacturers, so the company is not currently offering a consumer upgrade to MS-DOS 4.0.

"When 10% Isn't 10%" (November). On page 53, the table on the right should indicate that you enter *4* in cell B109, not cell B108. When you enter the values specified, cell B116 returns 53.75 and cell B119 returns 13.44.

"Analyze Your Database...Selectively" (November): On page 70, the formula for cell A16 is +A2<@DATE(86,1,1), but the formula for cell A17 should read +A2>@DATE(86,1,1). Four records meet the criteria.

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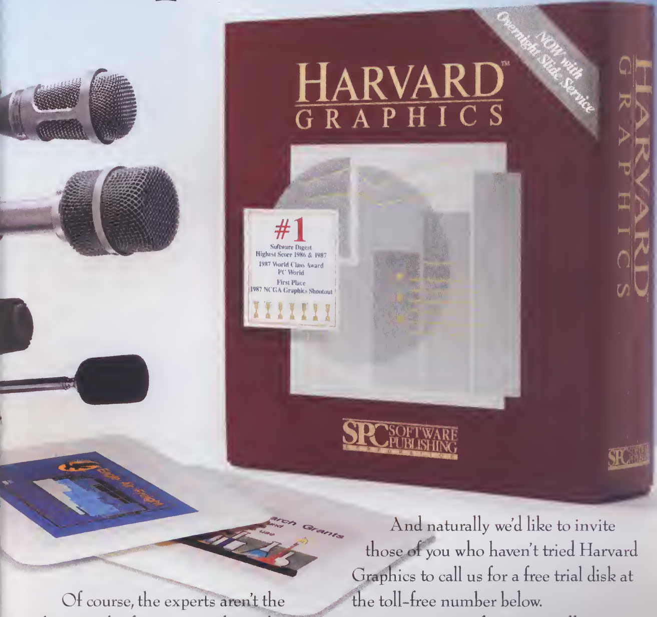
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INTEGRATED PROGRAMS FIND NEW MARKETS

It's the fastest-growing class of software.

Integrated software programs have been rediscovered. "There has been an explosion of interest," says Fred Thorlin, associate director of software industry services at Dataquest, a market research firm in San Jose, Calif. "Over the next four years, this should translate into growth of more than 32% annually."

After a two-year period of uninspired but steady growth, sales of integrated packages jumped 62%, from about 827,000 units in 1987 to more than 1.3 million units in 1988, according to Dataquest. That growth rate catapults this software category ahead of word-processing, database, spreadsheet, and even desktop-publishing programs.

The major growth by far has been in the low-end packages—those priced from $150 to $300. According to InfoCorp, a market research firm in Santa Clara, Calif., *First Choice* (Software Publishing Corp., Mountain View, Calif.) sold 50,000 packages within six months of its summer 1986 release. In 1988 the program sold nearly 165,000 copies, making it one of the 15 best-selling software programs of the year.

This leap to best-sellerdom convinced other software companies that there was a large reservoir of enthusiasm for all-in-one programs. Now, nearly a dozen low-end programs are in competition. In addition to *First Choice*, some of the better known include *Microsoft Works* (Microsoft Corp., Redmond, Wash.), *AlphaWorks* (Alpha Software

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Corp., Burlington, Mass.), and *Ability Plus* (Migent, Incline Village, Nev.).

Analysts attribute this growth to several factors. Aside from the appeal of a consistent interface and seamless data transfer, analysts point to an evolution in program features and the emergence of new markets in the small-business, home-office, and laptop arenas.

Low growth at the high end

However, sales of high-end packages—those with retail prices in the $600-to-$900 range—have grown much more slowly. InfoCorp's numbers show that unit sales of *Symphony* grew only 3% from 1987 to 1988. *Enable* (The Software Group, Ballston Lake, N.Y.) and *Framework* (Ashton-Tate, Torrance, Calif.) actually declined in unit sales during that period.

One reason may be that Ashton-Tate and Lotus Development Corp. were slow to release program upgrades. *Framework III* was finally released last July (the network version came out in December) after a hiatus of more than two and a half years. *Symphony* Release 2.0 came out a year ago, a year and a half after *Symphony* Release 1.2, and the next release isn't expected in the immediate future.

"In all honesty, we allowed ourselves to drift for a while because we weren't sure where the category was going," says Frank Ingari, vice president and general manager of Lotus's personal-computer spreadsheet division. "Now we know where we're going and we are pouring resources into *Symphony*."

However, even the current versions of *Symphony* and other high-end programs have been souped up with such features as programmable relational databases, word processors with multiple-language spelling checkers, and graphics. Some companies are adding work-group capabilities, such as electronic mail.

High growth at the low end

Current versions of low-end programs are also much richer and more robust than earlier versions. Word-processing modules commonly include a spelling checker and thesaurus; database components have more capacity and features; and graphics, macros, and communications log-on sequences are common. A couple of programs even have slide-presentation capabilities.

"The success of *First Choice* showed that integrated software was ideal for the person who needs a little bit of everything," says Selwyn Rabins, executive vice president of Alpha Software, whose *AlphaWorks* competes with *First Choice*. This person, by Rabins's definition, needs a word processor to write letters or memos, a spreadsheet to produce budget projections or a balance sheet, a database to store customer information, and perhaps communications to send purchase orders to the central office. In other words, "the software equivalent of the Swiss army knife," says Bill Coggshall, president of Desktop Presentations, a market research firm in Mountain View, Calif. Such a user doesn't need highly sophisticated software; convenience and economy are the selling points.

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This definition fits small-business owners, home-office workers, and laptop users, who make up the newest entry-level markets for integrated software. These people have become a strong focus for such industry giants as IBM and Microsoft, who see them as a relatively untapped market.

As part of a major reorganization last year, Microsoft created a division for entry-level software products. One of the division's most important products is *Microsoft Works*, which has been selling well to laptop owners. For example, SouthWestern Publishing Corp.'s field representatives use *Works* on their laptops. In addition, both 3M Corp. and the pharmaceutical firm Smith Kline & French Laboratories are currently testing *Works* for use on their laptops. And in June, as part of its positioning strategy for PS/2 Models 25 and 30 as home-office and small-business computers, IBM decided to bundle *Works* with the machines.

Uniformity and low price

"The new markets are growing superfast," says John Neilson, product manager for *Microsoft Works*. Analysts give several reasons. One is the lower price many people now pay for PCs. "Someone who buys a computer for $1,500 doesn't want to spend more than that on software," says Bill Higgs, vice president and director of software research at InfoCorp. "So it's easy for the computer salesperson to push a single under-$300 package that combines a bunch of applications." And for people new to computers, the integrated package is something of an inexpensive software sampler.

Price is not the only issue. Integrated programs also offer users a consistent interface and seamless data transfer between applications. For example, an integrated program lets you easily incorporate a spreadsheet or a graph into a word-processing document or transfer database information to a spreadsheet.

Some programs take seamless data transfer a step further by linking the data across applications. "For example, if you put a spreadsheet cell into a text document and later change the spreadsheet, the document will automatically change as well," explains John Porcaro, former product manager for *Ability Plus*.

And because the user interface is the same across applications, "users can learn five applications without learning five sets of commands," says Coggshall, of Desktop Presentations. "It makes them more productive and cuts down on training costs."

By contrast with these new programs, the early integrated programs, which first appeared in the summer of 1984, were only loosely integrated and didn't approach the depth and sophistication of existing stand-alone packages. "In a race for the market, the first integrated software was released before the products were completely done," says Robert Elliott, executive director of marketing for Informix Software (Lenexa, Kans.), maker of the *SmartWare* integrated package.

Now the software has matured: The integration is tighter, and functionality is flowering, even at the low end. For example, the word processor in Alpha Software's first integrated program, *Electric Desk*, offered an 80-character line, one set of margins for an entire document, a maximum document size of 32K, and no spelling checker or thesaurus. *AlphaWorks*, the company's new integrated program, allows for a 255-character line, multiple margin settings, a document size of 64K, a 100,000-word dictionary, and a 120,000-word thesaurus. It also has a mail-merge function that can use conditional logic. *AlphaWorks*' other modules have been similarly improved.

INTEGRATED PACKAGES ARE THE SOFTWARE EQUIVALENT OF THE SWISS ARMY KNIFE.

"Today's programs satisfy a larger segment of the user population," says Alpha Software's Rabins. "Originally we could satisfy only about 20% of the users. Now we can satisfy the needs of 60% to 70%."

In the future, Rabins says, we can expect full multiuser support and desktop-publishing features. Ted Judson, *First Choice* product manager, foresees outlining capabilities and fax support. And analysts predict that some integrated programs will be retooled to work under graphical user interfaces. Microsoft, for example, is reportedly working on a *Windows* version of *Microsoft Works*, which is not expected until late next year.

The feature evolution for the higher-priced programs has been just as spectacular. In *Framework III*, for example, Ashton-Tate added a 470,000-word thesaurus, spell-checking and automatic hyphenation in 10 languages, snaking columns, variable tabs and line spacing, footnotes, and other advanced features. Compared with Ashton-Tate's initial 1984 release of *Framework*, the current *Framework* spreadsheet is four times faster, the recalculation mode is now selectable, and the updated program has more than 160 functions. The original *Framework* had a nearly separate telecommunications program; this capability is now fully integrated. And the new LAN version includes electronic mail.

"If you compare our modules to today's top-of-the-line stand-alone programs, you will see that the missing features are highly specialized ones," says Pat Pipkin, the *Framework III* product manager.

Next up: integrated groupware

High-end programs are likely to evolve in the direction of groupware. "We are moving toward true integrated office systems," says Informix's Elliott. "They will include electronic mail, group scheduling, access to SQL [Structured Query Language] databases, and the ability to operate across all the popular operating environments."

While Lotus won't talk about future products, Ingari says the company is thinking about adding some *1-2-3* Release 3 features to *Symphony*. They include networking capability, a three-dimensional spreadsheet structure, and access to SQL databases.

Networking is one of the keys to the growth of high-end integrated programs. Several software publishers think a natural synergy exists between these programs and LANs. "When you share data on a LAN with stand-alone programs, you often lose attributes and data formats," says Elliott. He believes that by 1992, two-thirds of all desktop PCs will be connected. "This," he says, "is the primary reason for renewed interest in integrated products."

U.S. SALES OF SELECTED DOS-BASED PACKAGES (thousands of units)

	1986	1987	1988
Microsoft Works ($149)	0.0	10.6	57.6
First Choice ($159)	49.8	126.9	164.5
Enable ($695)	73.9	102.8	95.2
Framework III ($695)	30.0	16.8	13.6
Symphony ($695)	69.6	87.2	89.7

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Only OS/2 under Presentation Manager promises to deliver comparable integration and consistency of interface. But OS/2 will cost more than many people will want to pay. The hardware running OS/2 is more costly because of the additional memory required. And the software written for Presentation Manager will be more expensive because it requires more development time than DOS software does.

TODAY'S PROGRAMS SATISFY A LARGER SEGMENT OF THE USER POPULATION.

"There's an interesting space emerging in the marketplace between the 640K machine and the 6-megabyte machine needed to run a suite of Presentation Manager applications," explains Lotus's Ingari, who calls that space "power DOS." Filling that space, he believes, will be an 80286 or better computer with 1 megabyte of memory. "For the power-DOS environment," says Ingari, "integrated programs make a lot of sense."

—Henry Fersko-Weiss

EXPERT SYSTEMS: SHARP FOCUS, LOW PRICE

PC-based programs replace costly projects.

After a slow start, expert-system applications are making their way into the corporate setting by way of the PC. Many firms, particularly large ones, are reevaluating expensive expert-system development programs as they realize that small is beautiful. Developers are now producing useful, albeit narrowly focused, expert-system applications on PCs, which result in reduced investments of time and money and in greater returns.

Expert systems, a subset of artificial intelligence, capture the experience and reasoning power of a human expert in a given field. This information is then applied, in the form of rule- and object-based problem-solving techniques, to the subject of the application. Applications usually provide recommendations and decision-making support for problems of relatively narrow scope.

Examples of the success of PC-based expert-system applications abound:

- Ed Mahler, head of E. I. du Pont's artificial intelligence effort, says that his company spends an average of $25,000 to $50,000 per project for expert-system development. This year, he says, internally created expert systems will save the company tens of millions of dollars and provide a 1,500% return on labor and software costs.
- American Express uses an expert system called *Authorizer's Assistant* to help its staff approve or refuse charge transactions. The company reports a 20% decrease in decision time and expects to recoup most of its investment within the first year.

Large outlays and Renaissance men

Stanford University Professor Edward Feigenbaum was among the first to champion expert systems. In his book *The Fifth Generation* (Addison-Wesley Publishing Co., 1984), Feigenbaum claimed that an expert-system application called *Prospector*, developed by SRI International (Menlo Park, Calif.) led to the discovery of a molybdenum deposit valued at $100 million. Digital Equipment Corp. (Maynard, Mass.) has also endorsed expert systems, claiming that its *Expert Configuration System*, an expert system for configuring computers, saved the corporation more than $25 million.

The pioneering expert-system projects, however, required large hardware investments, such as $23,000-plus Lisp (list processing language) workstations from Symbolics or Texas Instruments. In addition, corporations believed that expert-system development required a "knowledge engineer"—a modern-day Renaissance man or woman versed in computer science, cognitive psychology, interviewing techniques, and problem-solving methods, who could perform miracles in the obscure Lisp programming language.

THE ONLY PRACTICAL WAY TO GET EXPERT-SYSTEM APPLICATIONS INTO CORPORATIONS IS ON A PC.

The result was that a typical project ran $500,000 to $1 million, and it was tough to get a reasonable return on investment. Disappointing initial returns led to disillusionment with pricey expert-system projects. "Deploying an expert system on a Symbolics or TI machine was just too expensive," says Dr. Murray Disman, chairman of International Planning Information, an expert-system consulting firm in Redwood City, Calif. He adds, "The only practical way to get expert-system applications into corporations is on a PC."

A two-part approach

Today's expert-system market for PCs has evolved into two segments. The first consists of expert-system-development "shell" programs, which allow a developer to build an application by adding specific knowledge to the shell. The second consists of the expert-system applications themselves. Many applications are created by organizations for internal use, but a growing number of commercial applications are appearing.

Michael L. Schneider, an analyst for Gartner Group, a market research firm in Stamford, Conn., notes that there are at least 1,700 major expert-system applications in use today. "This year we expect the market for expert-system shells, languages, applications, and hardware to reach about $400 million," he says. Schneider predicts that the market will grow at a 20% to 25% annual clip.

In an effort to develop cost-effective expert systems, many large corporations have bought PC-based expert-system shells and trained their existing staffs to develop economical, PC-based applications for internal use. In addition to du Pont and American Express, these corporations include Intel, Chrysler, Kodak, and Arthur D. Little. Internally developed applications may be as mundane as incoming-call directors and telemarketing aids or as complex as diagnostic applications that keep large plants functioning.

Of the expert-system shells available for use on PCs, *VP-Expert Version 2* ($249, from Paperback Software International, Berkeley, Calif.), which can access *1-2-3* files, is currently the most popular. At more than 30,000 copies, its sales represent "at least 40% of expert-system shells sold to date," notes Paul Harmon, editor of the San Francisco–based newsletter *Expert Systems Strategies*. Other popular shells include *1st-*

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Class ($495, from 1st-Class Expert Systems, Wayland, Mass.), *Level5* ($685, from Information Builders, New York City), *Knowledge Engineering System* ($4,000, from Software Architecture and Engineering, Arlington, Va.), and *Nexpert Object* ($5,000, from Neuron Data, Palo Alto, Calif.). Applications created in these four shells can access both *1-2-3* and *dBase* files.

Supplementing the internally developed applications are a spate of off-the-shelf applications. Perhaps the most widely known are style and grammar checkers. The two leaders are *Right-Writer* ($95, from RightSoft, Sarasota, Fla.) and *Grammatik III* ($99, from Reference Software, San Francisco).

Another application designed primarily for individuals, *Stock Expert* ($249, from Knowledge Garden, Nassau, N.Y.), incorporates the investment strategies and methods recommended by the National Association of Investment Clubs (NAIC) and applies them to historical data. It suggests buy, sell, and hold ranges of stock prices. The program can communicate with *dBase III* files and can import NAIC data downloaded from CompuServe.

Company policy to high finance

In the corporate arena, *Personnel Policy Expert* ($495, from KnowledgePoint, Petaluma, Calif.) helps an organization write an employee handbook. To use the program, which was created in 1st-Class Systems' *1st-Class* shell, you select and answer questions about 55 specific topic areas, such as jury duty, maternity leave, sexual harassment, nepotism, and so on. Based on your answers, the program writes the policy for each area, which you can then edit. For an annual fee of $95 (or $195 for three years), KnowledgePoint provides twice-yearly updates to keep you current on new and pending legislation on human resources issues.

Sterling Wentworth Corp. (Salt Lake City) offers several applications for the financial-planning community. *Planman* ($4,500) is a client-oriented financial-planning system for professional planners; *Step1* ($2,495) is a sales-oriented financial-planning system; *Next$* ($1,995) is designed for professional insurance planners; *Businessplan* ($2,995) helps closely held companies evaluate buy/sell agreements, executive benefits, key-employee policies, and other critical factors.

As expert-system applications grow in popularity and usefulness, access to corporate databases will become an important issue. "Expert systems that can't access massive amounts of corporate data would have a short half-life indeed," says Lou Robinson, publisher of the *Spang Robinson Report on Artificial Intelligence* (Menlo Park, Calif.). "Every *Fortune* 500 company," he adds, "has massive quantities of data waiting for expert systems to convert to a usable form."

—*Tom J. Schwartz*

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Nearly 100,000 investors use computers to try to get a leg up on the markets, and their numbers are growing. "With computerized investing, you can have the computer watch the market for you," says Michael Gianturco, author of *The Stock Market Investor's Computer Guide* (McGraw-Hill) and publisher of the weekly stock letter *The*

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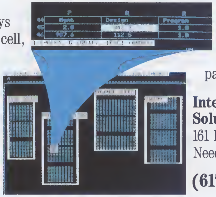

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Princeton Portfolios. "The computer becomes a burglar alarm for the preservation of your assets."

What computerized investing means is well illustrated by Mo Reinbergs, of Sarasota, Fla. He creates balance sheets and income statements from information on-disk from Standard & Poor's Stockpak II service. He gets prices on-line through Warner Computer Systems, a stock-quote service in Fair Lawn, N.J. And he uses *The Technician*, a financial-analysis package from Equis International (Salt Lake City). The $700 per year Reinbergs spends for his computerized information has paid off. "I bought Microsoft stock at $13, hours after it hit the secondary market, and it went to $79," he says. "I bought my Cadillac with some of that stock."

Is it worth the price?

"The more information you can get, the better your chance of success," says Keith Phillips, a partner in tax practice at Big Eight accounting firm Arthur Young & Co. But, he adds, cost-effectiveness is certainly an issue. Investors need to weigh the costs of computerizing against the amount they have to invest and the money they stand to lose or gain.

The rise of on-line, real-time stock quotes is the single most important change in computerized investment, says Gianturco. He subscribes to a service that delivers real-time stock quotes over unused portions of the FM radio band. Both Telemet America (Alexandria, Va.) and Lotus Signal use this method. You can also get real-time quotes over cable television networks from Data Broadcasting Corp. (Vienna, Va.) or from McGraw-Hill's Telecommunications X*Press service.

> THE COMPUTER BECOMES A BURGLAR ALARM FOR THE PRESERVATION OF YOUR ASSETS.

Real-time quotes, however, are not for the budget-conscious. For example, Signal costs $80 per month, plus $20 to $30 for each exchange you want to access. Ed Happ, client marketing director for Lotus Information Network Corp. (San Mateo, Calif.), says the average Signal bill runs $180 per month. But a successful trader, he adds, can make that on one trade. In addition, Lotus Information Network distributes the *Signal Software Directory*, a guide listing 35 software products designed to work with Signal. These include charting and technical-analysis programs, as well as programs for evaluating stocks, options, and commodities futures. (For a copy of the guide, call Link Telemarketing, 800-367-4670.)

Gianturco's system constantly monitors the market and alerts him when any stock he holds drops to a stop-loss level or rises to a profitable sell level. As a result, Gianturco can cash in his winners and dump his losers faster than people not similarly equipped. When he's away from his computer, Gianturco uses Lotus's QuoTrek to stay in touch with his stop-loss and sell alerts. The calculator-size device weighs 12 ounces and costs $400.

Each quarter, Gianturco screens 500 high-tech stocks for sales growth, debt, price/sales ratios, stock float, and other factors. He discards the top 10 to 15, which he figures anyone can find, then researches the rest. He recommends the most promising in his stock letter. According to *The Hulbert Financial Digest*, Gianturco's *The Princeton Portfolios* has the best five-year performance of roughly 110 such stock letters. *The Princeton Portfolios* costs $225 per year. The publication is available only on-line, through Investor's Resource (Boulder, Colo.). It will soon be available through Telescan (Houston).

In addition to carrying trading news and stock prices, some services deliver price charts. Telescan, for example, will send you graphs on roughly 10,000 stocks, mutual funds, and indexes, says sales manager Hodge Harger, although it doesn't currently offer commodities or options charts. The service is relatively inexpensive, averaging less than $30 per month, because its quotes are delayed 20 minutes.

All investors don't use the same system, of course. Robert Sherman, a Los Angeles investor, for example, trades in commodities. He uses a PC AT clone and spends about $400 a month for real-time data from Commodity Communications Corp. (Lombard, Ill.). "I can follow any commodity tick by tick," he says, "or put up to 16 of 30 available studies on the screen." For stocks, where he's less active, Sherman uses such services as Dow Jones News/Retrieval and CompuServe, where an experienced user can get a portfolio of stock quotes for $2 or $3, although there's a 15-minute delay.

Keeping costs down

James Smith, who runs the investment firm Smith Investment Management (Riverside, Conn.), prefers Dow Jones. In addition to closing prices, Smith needs the facts behind the figures. Dow Jones gives him news reports, earnings figures, and reports on individual stocks. He keeps his costs between $30 and $60 a month by setting up his computer to conduct on-line searches late at night, when the phone rates and service prices are low.

Terry Jeffers, editor of *The Computer-*

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ized Investor Report and director of the Jeffers Computerized Investor Corp. (Pleasanton, Calif.), is high on a new service called The Winning Investor System, from Desktop Broker (San Francisco). The Winning Investor System doesn't offer quotes, but instead offers stock picks, including a daily ranking of stocks it thinks will do best, along with their closing prices. Winning Investor's director of member services, George Holm, says the picks are determined by running figures from Lotus Signal and Standard & Poor's Compustat through a mainframe with performance-analysis algorithms written by computer experts and financial advisers. The cost of the service is a $695 initial fee, plus $1.55 for each 10 stock picks. "Our buy-and-hold people might pay $3 per month," says Holm. "Others might spend up to $100 per month."

Seeing the sell signs early

Jeffers estimates that only 1 in 200 individual investors is computerized, so you still have time to get a jump on noncomputerized investors. "Many people who were using technical charting saw the sell signs in mid-September 1987," he says, referring to the stock market crash of October 1987. "Enough of them got out before Black Monday to reconfirm my faith in technical charting and fundamental analysis."

Before you sign up for a quote stream and buy analysis and charting software, keep in mind that many investors do very well with more primitive methods. Take, for example, George Mueden, a retired Cornell University placement officer now living in Manhattan. Mueden uses *VisiCalc* on a Radio Shack TRS Model 4 and manually enters closing prices from the *Investor's Daily* each day. Before going on a cruise in August 1987, Mueden cashed in his mutual funds because he sensed a nervous market and didn't want to be disturbed by shore-to-ship calls from his broker. He cruised right through the October crash.

The moral is, the market doesn't always reward the investor with the most sophisticated computer rig, the fastest on-line quote service, or the best rumor wire. Sometimes it rewards instinct and dumb luck. But if you don't want to trust to luck, computerizing may improve your investment odds.

—Dana Blankenhorn

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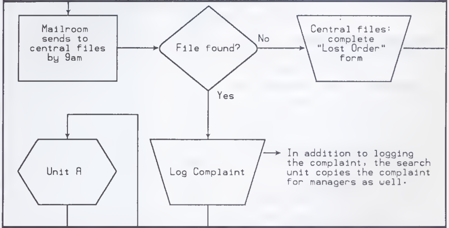
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LAPTOPS WITH DESKTOP FEATURES

More options, better displays, and color on the way

We've been primed to expect "the year of the laptop" each of the last few years. It's beginning to look like 1989 may be that long-rumored year. Compaq, NEC, and Zenith, to name a few companies, have announced laptop computers whose utility and features rival those of their desktop counterparts. Even color display, the last stronghold of desktop computers, is now available for laptops.

At Comdex/Fall '88, both Hitachi America and NEC Home Electronics U.S.A. showed prototypes of color laptops they expect to market in 1989. "You will definitely see the first wave of flat-panel, color LCDs in 1989," says Mark Eppley, president of Traveling Software (Bothell, Wash.), a manufacturer of file-transfer and other software for laptops. Sharp Electronics Corp. and an Epson America/Seiko team are also working on color displays, and Casio is rumored to have one. How good will they be? "The ones I've seen have 640-by-400-pixel resolution, are EGA-compatible, and are very impressive," says Eppley.

However, color technology will be pricey. Initially, color displays on top-of-the-line '386 laptops will boost retail prices as high as $7,000. Moreover, color displays use more power than monochrome displays and drain laptop batteries faster.

Resolution and readability

Those with less resilient pocketbooks can look forward to tremendous improvements in size, resolution, and readability of monochrome laptop displays. Analysts believe that high-resolution (640-by-480-pixel) monochrome displays that conform to the VGA graphics standard will become common this year.

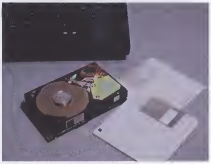
Compaq's SLT/286 laptop offers a 12-MHz clock speed and a high-resolution VGA display.

Compaq's SLT/286 laptop (see New Products, January) was the first with a VGA display, and now the new LEAP (low-power, enhanced AT portable) chip set from Chips and Technologies (San Jose, Calif.) promises to make it easier and less expensive for manufacturers to provide VGA displays. According to Gordon Campbell, the company's president and CEO, the LEAP chip set will be available for both 80286 and 80386SX CPUs and will combine advanced power-saving techniques, communications and I/O capabilities, and integrated VGA graphics. "Manufacturers will be able to get VGA graphics, with 16 shades of gray and no flicker, into a smaller space," he says.

In addition to crisper resolution, some laptops are offering "page-white" screens for better readability. These screens display black or blue characters on a white ground and use high-intensity fluorescent backlighting to increase brightness and contrast. The 80386 Zenith TurbosPort, for example, has a contrast ratio of 20 to 1, equal to the contrast ratio on conventional CRT monitors.

Along with display quality, the size, weight, and storage constraints that have plagued laptops are also yielding to technological advances. Many laptop makers now offer 20- or 40-megabyte hard drives that are smaller than their desktop counterparts. For example, PrairieTek (Longmont, Colo.) has recently started to ship a 20-megabyte hard drive that has only 2½-inch disks.

One of the smallest full-featured laptops is the Ultralite (see New Products, January), from NEC Home Electronics (Wood Dale, Ill.). It's a 4.4-pound, battery-operated computer that defines a new market—notebook computers. The $2,999 unit offers desktop-PC features in a package only slightly larger than a sheet of typing paper and less than 1½ inches thick. Tim Bajarin, a consultant with Creative Strategies Research International (Santa Clara, Calif.), expects that by this time next



The disks in PrairieTek's 20-megabyte hard-disk drive are only 2½ inches in diameter.

WHAT'S IMPORTANT IN A LAPTOP?

The computer-industry newsweekly *PC Week* recently asked corporate buyers of laptop computers to rate, on a scale of 1 to 100, the importance of eight features of laptops weighing less than 15 pounds. The 648 respondents thought the most important feature was compatibility, ahead of reliability and display quality. Compatibility, respondents said, means both the ability to run existing software and, to a smaller extent, the ability to accept external monitors and keyboards.

Although many makers advertise high-powered processors as a selling point of their laptops, respondents ranked performance near the bottom of the list. This wasn't surprising to Compaq spokesman Lynn Parsons. "A lot of people need a laptop to supplement their main computing environment," he says. "They don't necessarily need a '386." Also near the bottom of the list, price ranked 20 points below compatibility, suggesting that laptop users are willing to pay for the features they want.

PC WEEK POLL RESULTS

Compatibility	94
Reliability	92
Display quality	91
Keyboard	80
Vendor support	77
Relative price	74
Relative performance	72
Quality of documentation	71

—Jennifer Smith

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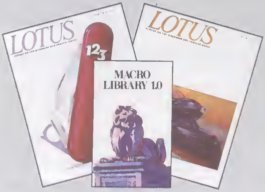

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At just 4.4 pounds, the battery-operated NEC Ultralite is one of the lightest laptops.

year there will be three or four other machines in this category and that prices will drop below $2,000.

The best of both worlds

All of this should help attract new customers to the already burgeoning laptop market. Estimates for U.S. market shipments are about 700,000 to 900,000 for 1988, according to Dataquest, a market research firm in San Jose, Calif. Dataquest analyst Sharon Hashimoto expects the market to double by 1990 and nearly triple by 1992. And if people begin viewing the laptop as an alternative to desktop machines, say analysts, those figures are on the conservative side.

NEC Home Electronics, for one, is trying hard to promote this view by offering what some might consider the best of both worlds. The company sells its ProSpeed 386 laptop with a desktop base that contains two disk drives and four full-size expansion slots. Known as a docking station or expansion bay, the unit gives you all the add-in cards and storage you need at work but lets you detach an 80386 laptop for working at home or on the road. Compaq's SLT/286 laptop also has an optional desktop expansion base.

You get two disk drives and four expansion slots with the docking station for NEC's ProSpeed 386 laptop.

Finally, don't expect laptops to be left out of the industry-wide move toward graphical user interfaces (GUIs). These GUIs, such as *Microsoft Windows* and OS/2's Presentation Manager, are generally used with mouselike pointing devices. While it's easy enough to add a pointing device to a laptop's serial port, industry observers expect forthcoming laptop keyboards to include some sort of built-in pointing device, such as trackballs or sliding keys that act like a mouse. In addition, most laptop manufacturers plan to add a dedicated mouse port to their machines. *—Jon Pepper*

COMPUTER NEWSLETTERS

Useful information abounds, much of it for free.

Computer-industry newsletters are plentiful these days. Some of the best known include Esther Dyson's *Release 1.0*, Stewart Alsop's *P.C. Letter*, The Cobb Group's product-specific reports, and Jeffrey Tarter's *Softletter*.

Hundreds of lesser-known newsletters also thrive, for two reasons. They cost little or nothing, and they satisfy a pioneering computer user's passion for useful information. Besides, discovering a nifty little out-of-the-way newsletter confers bragging rights, at least for the next staff meeting or user-group session. The cross section that follows illustrates the variety of what's available in both print and electronic form.

Small-circulation newsletters often focus on very specific subjects. Some actually arise in response to a single issue or event.

For example, *Computer Virology*, which started last year, is devoted to analyzing the contemporary problem of computer viruses, those rogue programs that destroy data. Published by Director Technologies, developer of the Disk Defender virus-detection hardware for hard disks, this free bimonthly covers such topics as identifying and protecting against viruses and analyzing the anatomy of a captured virus. The newsletter also carries commentary from Dennis Director, company president. For a copy, write to Director Technologies, 906 University Pl., Evanston, IL 60201.

Other small newsletters are dedicated to supporting a particular company's programs, hardware systems, or product lines.

For example, Lotus Development Corp.'s new *Thinking Visually* focuses on Lotus's business-graphics products, *Freelance Plus* and *Graphwriter II*. Coverage includes tips on specific programs, general ideas about graphics presentations, technical discussions, and training material. For more information on this free newsletter, write to Carole Gunst, Lotus Development Corp., 161 First St., Cambridge, MA 02142.

On-line users of Lotus software can visit The World of Lotus on CompuServe (enter *go lotus*) for up-to-date information on Lotus products and services. Among the features are drivers for various programs, reports on new products, information on third-party books and add-on products, and online support for Lotus products.

Desktop-publishing news

Hardware and software makers aren't the only new publishers. Independent user groups are also getting into the act. Not surprisingly, desktop-publishers put out many newsletters about publishing. The Ventura Publisher Users Group produces a monthly newsletter, each issue devoted to a different desktop-publishing topic. For more information, write VPUG, 7502 Aaron Place, San Jose, CA 95139.

The only way to get some of the livelier, more timely computer facts and gossip is over the telephone lines. In general, the only expense is the few minutes of connect time required to download electronically published material. Modem users around the world share mail, upload and download software, and participate in elaborate, prearranged conferences through various computer-information services.

Reviews of software and books

The Electronic Networking Association (ENA) supports these activities with its *Netweaver* newsletter. The publication features reviews of new services, books, and software, plus general news and commentary on the electronic-information scene.

Netweaver is available on several

commercial dial-up systems, including NewsNet, GEnie, and CompuServe. To spread the word, ENA members transmit the newsletter from system to system. You just log on and download it. For more information about *Netweaver*, write to the Electronic Networking Association, 2744 Washington St., Allentown, PA 18104.

Newsletter publishers have also discovered that the immediacy of electronic text is fundamental for perishable goods like breaking news. For example, *NewsBytes*, which is a weekly electronic computer-news magazine, has been available to subscribers of The Source since May 1983. Placed on-line every Saturday night, *NewsBytes* is a collection of national and international newsletters, including a Silicon Valley report by Wendy Woods, *NewsBytes* editor and founder. The publication reports from Canada, Europe, Great Britain, and Japan. To log on, enter *newsbytes* at The Source's main command prompt.

For daily doses of computer news, many modem users turn to CompuServe's *Online Today Daily Edition*. This daily newsletter is produced by free-lance writers and edited by the same CompuServe employees who publish the monthly *Online Today* print magazine. The electronic service, reached by entering *go olt* at any CompuServe prompt, provides commentary, product reviews, and news.

Your nearest source of on-line computer news may be as close as your neighborhood computer bulletin board system, that is, if the board's operator belongs to BBS Press Service. Founded in 1984, BBS Press Service produces a weekly collection of newsletters that are distributed through a network of some 200 bulletin board services in the United States and Canada. Its main product, the weekly *Info-Mat*, covers news, software, telecommunications, and bulletin board services. For more information, contact BBS Press Service, 8125 Southwest 21st St., Topeka, KS 66615. To visit BBS Press Service's own board, make a modem call to 913-478-9239. *—Charles Bowen*

INTERVIEW: MAKING ADVANCED MATHEMATICS UNDERSTANDABLE

Steve Wolfram may have solved the problem, even for math phobes.

Even in the hype-saturated software industry, few products come to market with the kind of positive word-of-mouth accorded Wolfram Research's *Mathematica*. Steve Jobs, who plans to bundle the program with his new Next computer, predicted that it "will revolutionize the teaching and learning of math by focusing on the prose of mathematics, without getting lost in the grammar." Others claim that it's going to be as basic to future computers as spreadsheets and word processors are today.

The program is like nothing else that currently runs on a personal computer. Before *Mathematica*, math professionals had to rely on a combination of expensive mainframe and minicomputer programs like *Macsyma*, programmed routines, and graphics and formatting software that often don't work well together. *Mathematica* takes the place of all of them. It has 700 built-in functions, its own high-level programming language, and a breakthrough graphics module that allows the user to put a complicated mathematical concept, such as a description of a three-dimensional geometric object, into visual form and then print it.

Mathematica consists of a standard kernel that does the calculations and a user interface that varies according to the hardware it's running on. Right now *Mathematica* is available on the Macintosh and Mac II, but other versions are in the works. IBM has announced a version for its RT workstation.

LOTUS recently spoke to designer Steve Wolfram, the MacArthur-Fellows-winning, 29-year-old president and CEO of Wolfram Research and professor at the University of Illinois. Lindsy Van Gelder conducted the interview.

LOTUS**:** Who's buying this program?

S. W.: My impression is that about a third are government, industry, and university researchers—physicists, mathematicians, medical researchers, and economists. Another third are engineers. The third third are "others" from funny areas we didn't expect, like financial analysis, and computer science.

LOTUS**:** What about math students?

S. W.: Unfortunately, the minimum memory configuration for the Macintosh version is 2.5 megabytes, and most college students haven't upgraded that far. I foresaw the nonsense with [rapidly rising] DRAM prices but hoped it wouldn't last as long as it has. On the other hand, the hardware will eventually catch up. The kind of math *Mathematica* does is what people have been wanting to do for centuries, and the program is going to stay relevant for a lot of years.

LOTUS**:** The people who read this magazine include a lot of users of *Lotus 1-2-3*. Can you tell them if there will ever

ARNOLD ZANN

WHEN COMPUTERS PRACTICE MEDICINE

Should automated procedures be more closely regulated?

Fatal errors. Medical-instrumentation makers worry about them more than ever these days. They have to.

Certain settings of a Therac 25 linear accelerator called for radiation to be applied through a metal plate that changes and reduces the beam intensity. An unforeseen combination of commands failed to activate the plate, so the software calculated the dosage incorrectly. The result was disastrous: Two people died; another was badly burned.

This may sound like a freak occurrence, but Food and Drug Administration Commissioner Frank Young, speaking at a dinner for the National Library of Medicine, read off a list of close to a dozen less serious incidents where software failures were suspected.

Furthermore, industry observers say that more such errors can be expected as medical instruments incorporate increasing amounts of software. Even with the best current technology, the possibility of software bugs cannot be completely eliminated.

That reality is raising some hotly debated practical, legal, and moral issues: Because of the potential for error, should computers be banned from medicine? Should the government regulate the sales of software used in clinical applications? How do you inspect the software-programming process?

"Certainly no decent society tolerates repeated fatalities or serious injuries once we know the cause," advises Professor Vincent Brannigan, who teaches product liability and government regulation at the University of Maryland and law and technology at Georgetown University Law School. But when evaluating the technology, he points out, we have to look at the real choices. "The standard should be improvement over manual alternatives, not perfection."

Software problems are not unique to

---

be an MS-DOS version of *Mathematica*, and if so, what it will do?

S. W.: Right now, we're running a '386-based version, and while I hate to make promises, I think it's fair to say that it will be available in a matter of months. As for what it will do for spreadsheet users, I'd say it's a decent upgrade path for users who have been wanting to set up more sophisticated models. But I think you'll also see models created or studied on *Mathematica* converted into *1-2-3* macros and used by a broader group of people.

***LOTUS*:** The IBM RT version requires 8 megabytes of RAM and a 70-megabyte hard-disk drive. Would an MS-DOS version have fewer functions?

S. W.: No, the code is identical. The issue is that the more powerful your computer or the more memory it has, the more you can do. If you were solving a problem and you wanted a fourth-order approximation, you'd have to do it on a minicomputer. You could do a third-order approximation on a Macintosh, and a fifth-order approximation on a supercomputer.

***LOTUS*:** The reviews have focused on the graphics capability. Can you tell us what businesspeople can do with it?

S. W.: Well, the graphics capability is nice and new and it's the first thing that strikes people. But actually, a lot of users never even use the graphics. They're interested in crunching large algebraic expressions, not drawing three-dimensional pie charts, although in theory you can draw them. It's just that right now, most people are using *Mathematica* as an enhanced calculator. As time goes on, there will be more third-party applications that work with *Mathematica.*

***LOTUS*:** So someone who knows what businesspeople need will use *Mathematica*'s graphics language to create a whole other graphics program?

S. W.: Our guess is that in a few years, a good fraction of people who use the program won't even know they're using it. We intend to see it embedded as a sort of computational engine inside specialized applications, whether it's business stuff or chemical engineering—or music. From a marketing standpoint, I think our first challenge is to convince everybody who's now using math to use *Mathematica*. Our second challenge is to create tools that enable people who now *don't* use math to use it.

***LOTUS*:** Most people who use math professionally have learned Fortran or Pascal or C. Why would they want to learn yet another programming language?

S. W.: That's the conventional wisdom. We say, however, that our programming language is one of the easiest languages to learn. In fact, people are talking about using it as a first language to teach computer science students. It's easier than BASIC and a lot more sophisticated.

***LOTUS*:** What about people who've already spent years developing programs in another language?

S. W.: I'd still ask them to consider using *Mathematica* for their next program. We're also trying to get them to use *Mathematica* with the programs they've already written. They can plug into *Mathematica* and use it, say, to make *Mathematica* graphics from their data. So far, we haven't seen as much work in this area as we expect to see in the future when we come out with the workstation version, because right now the main installed base is on the Macintosh. That kind of work can't be done on the Macintosh because it requires multitasking, which the Mac can't do. We're believers in open-architecture software. For instance, we've set it up so that on a Unix system, you can send data through pipes [programming hooks] to *Mathematica*.

***LOTUS*:** I asked a math professor at the University of Texas what she wanted to know about *Mathematica* She said, "Accuracy." Lives depend on mathematical calculations when you're designing something like the space shuttle. How accurate is your program?

S. W.: We worry about it. The worst case would be an answer that's plausible but wrong. So far, that hasn't happened. We've developed good automated testing software, and we've been incredibly careful. On the other hand, I'm sure 20 years from now, people will still be finding bugs in *Mathematica*. But that's because I'm sure 20 years from now people will still be using *Mathematica*. ■

medicine. Banks worry about the accuracy of their accounts, airlines worry about the efficiency of their passenger-reservation systems. Medical software, however, along with the software used in nuclear power plants and by the military, for example, is in a different class.

According to manufacturers, the medical-device industry is already taking appropriate steps. "We would never ship a product with a known patient-safety bug," insists Rick Beebe, a research and development manager with Hewlett-Packard in Waltham, Mass. "We try to anticipate both the use and the misuse of the software," adds Richard Fries, former manager of reliability assurance at Ohmeda (Madison, Wisc.), a maker of devices such as infant-care monitors and anesthesia equipment.

The government steps in

However, even the best efforts can't guarantee absolute success, warns Dr. Ruth Dayhoff, a medical-computer expert in the Washington, D.C., area. "You have to be able to define what a device could do that's dangerous." In addition, cautions Roger Schneider, former associate director for science at the FDA's Center for Device and Radiological Health, "Microprocessors have made it possible for fairly naive people to implement complex systems quite quickly."

The testing of medical software isn't always rigorous. "Most software undergoes a level of checkout that's perhaps 10% of what's needed," says Edward Miller, president of consulting and testing firm Software Research (San Francisco). The industry's lack of rigor has also caught the government's attention. If medical devices are computerized systems, the FDA claims jurisdiction over their manufacture, marketing, and use. While some people say it took the radiation-overdose deaths to get some serious attention, FDA managers say the agency has actually shown increasing interest in computers for years.

The FDA already regulates computer systems in drug manufacturing. The agency, as well as the Congressional Subcommittee on Investigations and Oversight, has also started looking into the role of artificial-intelligence techniques such as expert systems.

The FDA reserves the right to regulate any computer product that directly connects to a medical device. The level of regulation would depend on whether the device performed routine data collection and manipulation functions, recommended specific courses of action, or actually controlled a medical procedure.

In the latter category, the FDA further distinguishes between devices that operate automatically and those controlled by expert systems in which there is an opportunity for "competent human intervention." If a medical practitioner has to examine and approve proposed actions before proceeding, then the FDA is prepared to grant the manufacturer more regulatory latitude.

The current FDA policy in this area, coupled with any regulations and guidelines the FDA might subsequently issue, could shape the industry decisively. And when you add the possibility of multimillion-dollar lawsuits, you have quite a controlling influence on computer-run medical devices.

While the FDA ponders its next move, the instruments continue to arrive. As long as the instruments are subservient to human judgment, most doctors approve. "We're used to working with equipment whose use has inherent problems. We have the same problems with humans—we all make mistakes," comments Dr. Neal Cohen, director of the intensive-care unit at the Medical Center of the University of California, San Francisco.

NO PROGRAM IS BUG-FREE ENOUGH TO TRUST WITH A HUMAN LIFE.

Cohen points out that both mechanical and software-controlled machines are already essential in many areas of medicine. "We have patients who are on mechanical breathing machines. We don't stand and watch the machine; essentially, we have equipment monitoring the equipment," he says.

In addition, a doctor can commit an error of omission by failing to use the technology, says Dr. Beverley Kane, a research physician at Stanford University. "There's an ethical issue in not using computers, not using medical databases, not using expert systems," she says. Doctors can't just avoid the machines. On the other hand, she admits, "not a program in the world is bug-free enough to trust a human life to."

According to Professor Brannigan, the broader question for society is: Are we better off pushing the technology further, gathering the benefits, and accepting the occasional mistakes? "My belief," he says, "is that it's worth the occasional injury or death."

Although the industry's largely favorable record is reassuring, "We're only at the very beginning of the problem," Brannigan warns.

Does that mean that a patient in a clinic or hospital should worry about the quality of the programmer as well as of the health-care practitioner? "If you're going in for radiation therapy," says Schneider, "I'd worry about it."

—Steve Rosenthal

KEVIN JANKOWSKI

SHAKESPEARE IN RAM

His complete works on disk

Steve Jobs's new Next Computer System will come with the complete works of Shakespeare on its built-in optical disk. However, for those who want an electronic version of Shakespeare but don't want to shell out $6,500 for a Next machine, Electronic Text Corp. (Provo, Utah, 801-226-0616) has announced *The Riverside Shakespeare*. It's a collection of William Shakespeare's complete works on a set of ordinary floppy disks. Once you copy the floppies to a hard disk, you can search the plays, sonnets, and so on with one of the company's text-retrieval programs.

Electronic Text, which struck a deal with Houghton Mifflin Co. (Boston), markets the collection on four sets of disks: comedies, histories, tragedies, and romances and poems. You can buy the sets individually for $99 each, or you can buy the complete collection for $299. You will also need Electronic Text's *WordCruncher Jr.* ($99), *ViewEtc* ($175), or—if you want to view, index, and search your own documents as well—*WordCruncher* ($299).

More than literary trivia

Expect some interesting results. Looking at the plays with a computer's relentless attention to detail has already told us that Shakespeare's works comprise 29,066 different words: 8,884,647 words altogether in 21,959 speeches.

But Dr. Louis Marder, professor emeritus of Chicago's University of Illinois, who has published the acclaimed *Shakespeare Newsletter* for 38 years, thinks computerized research will produce more than literary trivia. Searchable Shakespeare, in fact, will allow anyone to become "an armchair scholar," he says. "There is no limit to what we can learn about Shakespeare."

For example, *Romeo and Juliet* contains more than a hundred allusions to darkness and light. "It took years to pinpoint the imagery that *WordCruncher* finds in seconds," says Dr. Marder.

For those wanting to sample digitized Shakespeare, Electronic Text offers an IBM-compatible demonstration disk ($10) that includes the play *Two Gentlemen of Verona* and a modified version of *WordCruncher*. While *The Riverside Shakespeare* and *WordCruncher* require a hard disk and a minimum of 512K of RAM, the demo can run on a standard two-floppy-disk system.

The firm also offers the works of Emerson, Twain, Thoreau, Melville, Whitman, Henry James, Jack London, and Benjamin Franklin on searchable optical disks, and it has a CD-ROM version of *WordCruncher*.

—Charles Bowen

DIANE TESKE HARRIS

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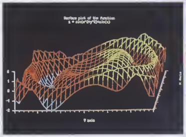

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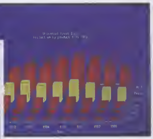

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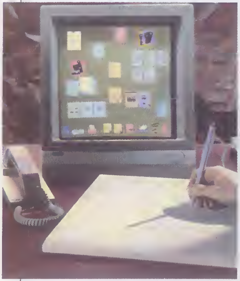

VOICE, DATA, PICTURES, AND HANDWRITING TOO

Wang's Freestyle personal-computing system, released last month, is the latest innovative attempt to integrate voice, data, graphics, and handwritten messages on a personal-computer network. "It will be to business what the Next computer will be to education," says Scott C. McCready, of the market research firm CAP International, referring to the improved price/performance standard the Next machine has set for computers in education.

You can start with any document created in standard PC software, such as *1-2-3* or *WordPerfect*. Then the Freestyle system lets you add notes by typing them or jotting them on a tablet with an electronic pencil. You can also capture paper documents, charts, or pictures by scanning them into the system or by receiving them directly to the PC from a fax network. Finally, you can speak into a telephone-like handset to record additional comments or instructions and then transmit the entire multimedia package—including the digitized voice component—over Wang's VS Office network. If you have an optional fax board, you can send the package, minus the voice component, to any fax machine conforming to the Group III communications standard.

The system's base components, the tablet and electronic pencil, cost $1,995, including icon-based software. The voice capability adds another $1,495, and the fax option is $1,595. The Freestyle system runs on the Wang PC 200/300 series systems and other IBM PC AT–compatible computers. *—Jennifer Smith*

CD SOUND PLUS TV RESOLUTION ON PCs

Next spring, a new add-in board from Intel Corp. will bring CD-quality sound and TV-quality color graphics to personal computers. The board uses Digital Video Interactive (DVI) technology, which was originally developed at what was then RCA Labs in Princeton, N.J. Intel bought the technology from General Electric last October, after GE acquired RCA.

Intel's DVI board almost instantaneously compresses and decompresses sound and video files stored on CD-ROMs. Intel expects to shrink the board down to a single chip by 1991 and says the current $2,500-to-$5,000 price should drop to around $500.

Graphics files are notorious memory gobblers. A standard graphics screen of mid-range resolution requires about 600K of storage. At 30 frames per second, just one second of live action requires 18,000K.

In contrast, DVI's compression algorithms can pack more than an hour's worth of video and sound onto a CD-ROM. Not only do the algorithms save space, they also compensate for slow CD-ROM disk access by processing images slightly in advance of when they are needed on the screen.

Action-packed arcade games are currently a hot DVI development area. Lotus and Microsoft say they intend to develop DVI applications, as well.

—Rich Friedman

VISUALS IN THE LANGUAGE LAB

Remember how you learned a foreign language? Today, learning a new language doesn't have to mean spending endless hours filling out workbooks and talking back to audiocassettes. Dartmouth College's Language Resource Center, for one, is moving language-learning into the computer age. Dartmouth's Chinese-language students, for instance, use a Macintosh program, *Hanzi Assistant*, that lets them look up a Chinese character, check the English translation, listen to the computer pronounce it, and watch the program draw the character's brush strokes. *Hanzi Assistant* is based on a similar program, *Chinese Character Tutor*, developed at Mount Holyoke College for use on IBM computers.

German-language students can use a hypertext-based Mac program called *TextWindow*. While reading German short stories or newspaper articles on the screen, students can click on any word and get an English translation in a window at the bottom of the screen. Additional windows provide grammatical notes and cultural information. Versions of *TextWindow* for other languages are also on the drawing board.

Another Mac program, *A Tour of Mainz*, provides a digitized "tour" of that city. Eventually, the program will incorporate video tours.

In an even broader departure from conventional language-learning, Dartmouth's Language Resource Center uses an interactive videodisk system that combines language comprehension with culture. It shows the classic French film *La Grande Illusion* and then asks French-language students questions about different scenes.

Unfortunately, you cannot buy any of Dartmouth's language-learning programs at your local computer-software store. However, the school is willing to make the programs available to other colleges and universities. *—J. S.*

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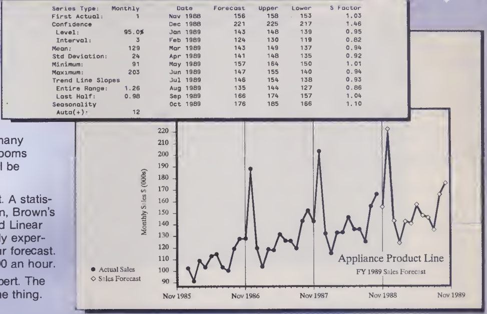

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Series Type:    Monthly          Date      Forecast   Upper    Lower     S Factor
First Actual:         1        Nov 1988        156     158      153         1.03
Confidence                     Dec 1988        221     225      217         1.46
 Level:           95.0%        Jan 1989        143     148      139         0.95
 Interval:            3        Feb 1989        124     130      119         0.82
Mean:               129        Mar 1989        143     149      137         0.94
Std Deviation:       24        Apr 1989        141     148      135         0.92
Minimum:             91        May 1989        157     164      150         1.01
Maximum:            203        Jun 1989        147     155      140         0.94
Trend Line Slopes              Jul 1989        146     154      138         0.93
 Entire Range:     1.26        Aug 1989        135     144      127         0.86
 Last Half:        0.98        Sep 1989        166     174      157         1.04
Seasonality                    Oct 1989        176     185      166         1.10
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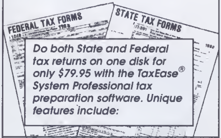

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LOTUS ANNOUNCES NEW UTILITY: MAGELLAN

In January Lotus Development Corp. announced a new file-management and text-retrieval utility, *Lotus Magellan*. The program lets you quickly locate and view any file on your computer's hard disk.

You can institute a search based not only on a word within a file but on a phrase or a concept, as well. *Magellan*'s file-format readers can recognize and display files from leading software applications such as *dBase, Microsoft Word, MultiMate, WordPerfect*, and Lotus programs, regardless of whether the application is loaded. That is, you can scroll from a word-processing file to a spreadsheet file to a database file and see the contents of those files exactly as they appear in the originating applications. A split-screen display shows the file name in one window and the file contents in another.

Once you've located a file, you can copy, move, delete, or print it from within *Magellan*. Or you can mark a group of files for collective action. For example, you can specify that all files with a certain file-name extension be moved to another subdirectory. You can also gather whole or partial files from different applications into a single new ASCII file. In addition, you can use *Magellan*'s Launch command to load an application, along with a selected file.

Magellan will have a retail price of $195 and will be available through Lotus-authorized resellers in the first quarter of 1989. Lotus says the program is licensed for individual use only and cannot be used on a network server.

1-2-3 BUSINESS APPLICATIONS

In mid-December, Lotus Development Corp. released *Lotus 1-2-3 Business Applications*, a set of six spreadsheet templates for financial analysis and planning. The templates require only the information from a company's income statement and balance sheet. The Cash Flow template produces a statement of cash flow from operations and identifies current cash positions. The Source and Use of Cash template highlights the non-operating items that affect cash flow, and the Financial Ratios template calculates key financial relationships, such as liquidity, leverage, and profitability ratios. Cost-Volume-Profit creates an income statement based on fixed and variable costs and calculates break-even volume. The Cash Budget template projects a 12-period cash budget and identifies both the timing and the amount of required new financing, and Pro Forma Financial Statement lets you create estimated financial statements and perform what-if analyses.

Previously offered only with the *Lotus 1-2-3 Small Business Kit*, the set of six templates is now available separately through the *Lotus Selects* catalog for a suggested retail price of $79. The price includes six months of unlimited, toll-free telephone support. For a copy of the catalog, call 800-635-6887.

FREELANCE PLUS 3.0 SHIPS

Lotus Development Corp. shipped *Lotus Freelance Plus 3.0*, a business graphics package that lets PC users create professional-quality graphics and presentations. The product was announced in October and shipped on schedule. If you purchased *Freelance Plus* between September 6, 1988 and January 15, 1989, you may upgrade to *Freelance Plus 3.0* at no charge. For more product and upgrade information, see @LOTUS in the November issue, page 26.

DATES SET FOR DEVELOPER CONFERENCE

The fourth annual Lotus Developer Conference will take place June 28 to 30 at the World Trade Center in Boston. The conference is open to anyone who provides custom applications, add-ins, training products, or consulting services for *1-2-3, Symphony, Lotus Agenda*, or other Lotus products. Conference topics will include the latest Lotus technologies and innovations in Lotus aftermarket products and services. For more information on the Lotus Developer Conference, call 617-577-8500, ext. 8559.

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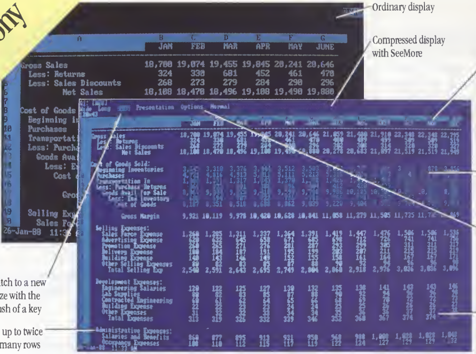

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        A                 B       C       D       E       F       G
                         JAN     FEB     MAR     APR     MAY    JUNE
Gross Sales            18,700  19,074  19,455  19,845  20,241  20,646
  Less: Returns           324     330     681     452     461     470
  Less: Sales Discounts   268     273     279     284     290     296
          Net Sales    18,100  18,470  18,496  19,100  19,490  19,880

Cost of Goods
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SAVE THE DISPLAY

Use these Release 2/2.01 macro routines to record and renew the appearance of the screen.

BY DANIEL GASTEIGER

There are times when you want to look at one area of the worksheet while you are running a macro, but the macro needs to move the cell pointer to another area. In most cases, the macro records the address of the current cell, sends the cell pointer where it needs to go, and then uses the {GOTO} command to return the pointer to its starting cell.

This technique is adequate, but it can be disconcerting. When the macro moves the cell pointer away and then back, the cell where the pointer started often ends up in the top-left corner of the display. If that cell had started near the middle of the display, the user would have to first get reoriented and then might even need to reorient the worksheet.

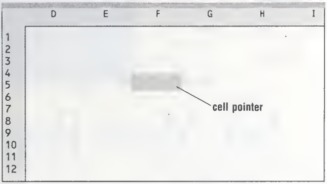
This month's column showcases two macro routines submitted by Ronald L. Hari, of Advanced American Technologies (Langhorne, Pa.). The first routine records information about the orientation of the worksheet and the cell pointer in the current display. The second routine uses the recorded information to restore the display once other macro routines have moved the cell pointer.

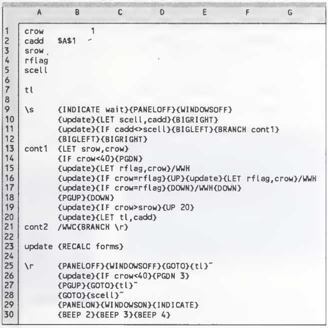
THE SCREEN SAVER

You must record only two pieces of information to be able to reproduce the display: the address of the cell pointer and the address of the display's top-left cell.

Once you know the display's top-left cell, you can easily use the GOTO key to realign the worksheet on screen. Simply make sure that the top-left cell is off-screen, then press the GOTO key and enter the cell's address. To restore the cell pointer to its starting cell, use the GOTO key once more.

To see how this works, start in a blank worksheet, and use the following steps to re-create the display shown in the figure at the top of the next column. Press the PageDown key several times, then press the GOTO key and enter *D1*. *1-2-3* positions the worksheet with cell D1 in the top-left of the display. Now press GOTO a second time and enter *F5*; the display appears as it does in the illustration.




```
        A       B       C         D         E         F         G
1   crow           1
2   cadd    $A$1
3   srow
4   rflag
5   scell
6
7   tl
8
9   \s      {INDICATE wait}{PANELOFF}{WINDOWSOFF}
10          {update}{LET scell,cadd}{BIGRIGHT}
11          {update}{IF cadd<>scell}{BIGLEFT}{BRANCH cont1}
12          {BIGLEFT}{BIGRIGHT}
13  cont1   {LET srow,crow}
14          {IF crow<40}{PGDN}
15          {update}{LET rflag,crow}/WWH
16          {update}{IF crow=rflag}{UP}{update}{LET rflag,crow}/WWH
17          {update}{IF crow=rflag}{DOWN}/WWH{DOWN}
18          {PGUP}{DOWN}
19          {update}{IF crow>srow}{UP 20}
20          {update}{LET tl,cadd}
21  cont2   /WWC{BRANCH \r}
22
23  update  {RECALC forms}
24
25  \r      {PANELOFF}{WINDOWSOFF}{GOTO}{tl}~
26          {update}{IF crow<40}{PGDN 3}
27          {PGUP}{GOTO}{tl}~
28          {GOTO}{scell}~
29          {PANELON}{WINDOWSON}{INDICATE}
30          {BEEP 2}{BEEP 3}{BEEP 4}
```

Having a macro record the address of the current cell is easy, but recording the top-left cell's address is quite difficult. The macro above performs both tasks.

To create the macro, enter labels as shown, but omit for the moment the two entries shown in red. Use the Range Name Labels Right command to assign the labels in column A as names for the adjacent cells of column B. Then use the Range Name Create command to assign the name *forms* to range B1..B2. Finally, enter the formula

@CELLPOINTER("row") into cell B1 and the formula @CELLPOINTER("address") into cell B2.

To see how the macro works, start with the cell pointer anywhere in the worksheet, hold down the MACRO key (Alt on most computers), and press S. The screen will be static, but your computer will beep several times. When the screen flickers once and you hear a beep of several different tones, the macro has finished. Move the cell pointer around on the worksheet, then refresh the display by holding down the MACRO key and pressing R. Again, a beep of several different tones alerts you when the macro has finished.

THE TECHNIQUES SUMMARIZED

The screen-saving macro relies on worksheet mechanisms that we usually overlook. It breaks the task of preserving the display's appearance into three parts: recording the address of the cell pointer, moving the pointer to the leftmost column of the display, and finding and recording the address of the topmost visible cell in that column.

The macro relies on two formulas to help identify cells in the worksheet. Those formulas reside in cells B1 and B2. The first formula, @CELLPOINTER("row"), returns the number of the row in which the cell pointer resides. For example, when the pointer is in cell B5, the formula @CELLPOINTER("row") returns 5.

The second formula, @CELLPOINTER("address"), returns the absolute address of the cell holding the cell pointer. When the pointer is in cell B5, @CELLPOINTER("address") returns B5. *1-2-3* doesn't keep the @CELLPOINTER formulas current as the cell pointer moves about in the worksheet. Rather, *1-2-3* updates the formulas only when the worksheet is recalculated.

With these things in mind, the macro begins by calling a subroutine named *update*, which recalculates the @CELLPOINTER functions based on the current location of the pointer. Then the macro saves in *scell* the result of the function @CELLPOINTER("address"). These few steps take care of the macro's first task: recording the starting address of the cell pointer.

FINDING THE LEFTMOST COLUMN

To understand how the macro finds the leftmost column of the display, play around with your computer's Tab key. Pressing the Tab key shifts the worksheet one screen's worth of columns to the right, and pressing Shift-Tab moves the worksheet a screen's worth of columns to the left. In either case, the cell pointer ends up in the leftmost column of the new display.

When you press the Tab key and immediately press Shift-Tab, the cell pointer jumps to the leftmost column of the current display. The only time this doesn't happen is when the cell pointer is too close to the right border of the worksheet (column IV). In that case, the screen doesn't change in appearance when you press Tab, and the cell pointer remains in place.

The display-recording macro uses a {BIGRIGHT} command to press the Tab key, then determines whether the cell pointer has moved. If the pointer has moved, the macro uses a {BIGLEFT} command to press Shift-Tab, and the cell pointer ends up in the leftmost column of the original display.

If the cell pointer doesn't move when the macro presses Tab, the macro reverses the order of its {BIGRIGHT} and {BIGLEFT} commands. Pressing Shift-Tab followed by Tab also moves the pointer to the leftmost column of the current display, unless the pointer is too close to the left worksheet border (column A).

By the time the macro has processed its fifth line of instructions, it has recorded the starting address of the cell pointer and moved the pointer to the display's leftmost column.

GETTING TO THE TOP

Having used {BIGRIGHT} and {BIGLEFT} commands to find the display's leftmost column, the macro turns to *1-2-3*'s windowing capability to ascertain the display's top row.

The standard worksheet display shows 20 rows. When you press PageUp, the worksheet shifts to display the 20 rows directly above the original 20. Likewise, when you press PageDown, the 20 rows below the original 20 become visible. In either case, the cell pointer ends up as many rows from the bottom of the display as it began.

By selecting /Worksheet Window Horizontal, you can split the display into two windows. Each window shows fewer rows than the standard window, so pressing PageUp and PageDown produces smaller jumps in the worksheet.

When *1-2-3* creates two windows, the cell pointer ends up in the bottom row of one window. By pressing PageUp at that point, you move the cell pointer to the row that started out just above the original display's top row.

In a nutshell, when you select /Worksheet Window Horizontal and then press PageUp DownArrow, you move the cell pointer to whatever row started at the top of the display. These are the keystrokes the macro uses to find the top row of the current display.

Unfortunately, there are times when these keystroke sequences don't work. For example, when the cell pointer begins near the top of the worksheet, pressing PageUp can move the pointer to row 1 rather than to the row just above the current display. Also, if the pointer is in either the first or last row of the display, the Worksheet Window Horizontal command won't create a second window; the cell pointer remains in place.

To account for the first problem, the macro presses PageDown if the cell pointer starts out within 40 rows of row 1. The macro finds the top row of the new display, then moves the cell pointer up 20 rows. This is the row that was at the top of the display when you ran the macro.

To account for the second problem, the macro monitors the effect of the Worksheet Window Horizontal command. When the command succeeds, the cell pointer moves up one row in the worksheet. When the command fails, the pointer remains where it starts.

After processing the Window command, the macro compares the cell pointer's current row number with its starting row number. If the numbers match, the command has failed. The macro moves the cell pointer up a row and issues the Window command a second time. If the command fails again, the macro moves the cell pointer down a row and issues the command once more.

Eventually, the macro succeeds in creating a second window. Then it's a simple matter to find the top row of the original window. By the time the macro processes the command in row 20, it has recorded the address of the cell that started in the top-left corner of the display.

RE-CREATING THE ORIGINAL

The macro's gymnastics let it record the cell pointer's start address and the address of the display's top-left corner. A few more gymnastic movements re-create the original display.

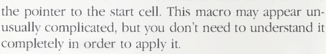
The macro named \r moves the cell pointer to the top-left cell of the original display, then presses the PageDown or PageUp key to make sure the top-left cell isn't visible.

Now when the macro uses the GOTO command to move the pointer back to the original top-left cell, that cell will appear in the top-left corner of the display. Then the macro uses the GOTO command once more to move the pointer to the start cell. This macro may appear unusually complicated, but you don't need to understand it completely in order to apply it.

There are also some situations in which the macros won't work. For example, the macros are likely to fail if you've set titles in your worksheet. The cell pointer will end up in its original starting cell, but the display may not finish with the correct top-left cell.

The macro eliminates any windows you might have set before running it. This means it can't regenerate a windowed display. In fact, the final display might barely resemble the original one if you run the macro in a worksheet divided by the Worksheet Window Vertical command.

With these points in mind, it's easy for you to have your macros record the worksheet's display. Include the macros from this article in your worksheet. When your macro must record the display, have it call the macro named \s as a subroutine. When the macro must refresh the display, have it call the macro named \r. The following illustration shows how this might look:



```
      A       B         C         D         E         F
33  \m      {\s}
34          {GOTO}{NAME}{?}~
35          {?}~{\r}
```

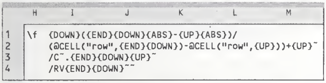
Continue in the worksheet you've already created and enter the labels as shown. Then assign the name \m to cell B33. Run the macro by holding down the MACRO key and pressing M.

The macro records the current display, then presses the GOTO and NAME keys. It pauses so that you can enter a cell address or a range name, then it moves the cell pointer to the cell you indicate. The macro pauses again until you press Return, then it re-creates the display as it was when you started the macro.

MACRO LETTERS

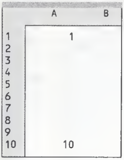
NUMBER FILL

I use the Data Fill command in *1-2-3* Release 2.01 to enter a sequence of numbers in a column. There are times, however, when I need to fill in evenly sequenced numbers between two numeric endpoints. I use the following macro:



```
     H      I          J          K          L          M
1   \f   {DOWN}({END}{DOWN}{ABS}-{UP}{ABS})/
2        (@CELL("row",{END}{DOWN})-@CELL("row",{UP}))+{UP}~
3        /C~.{END}{DOWN}{UP}~
4        /RV{END}{DOWN}~~
```

To try the macro, enter labels as shown and select /Range Name Labels Right to assign the name \f to cell I1. Before you run the macro, enter one number in any cell, move down as many rows as you want intervals, enter a second number, then reposition the cell pointer on the first number. Run the macro by pressing MACRO-F.



```
         A         B
1             1
2
3
4
5
6
7
8
9
10           10
```

To understand how this macro works, enter *1* in cell A1 and 10 in cell A10 as shown in the adjacent figure:

My macro moves the cell pointer to A2 and enters the following formula:

($A$10 – $A$1)/(@CELL
("row",A10..A10) –
@CELL("row",A1..A1)) + A1

The macro copies the formula to range A3..A9 and uses the Range Values command to convert the formulas to values.

The formula subtracts the first number from the last and divides the result by the total number of rows. Here's how the macro works:

{DOWN}({END}{DOWN}{ABS} – {UP}{ABS})/ moves the cell pointer down one row and begins entering the formula.

(@CELL("row",{END}{DOWN}) – @CELL("row", {UP})) + {UP}~ finishes entering the formula.

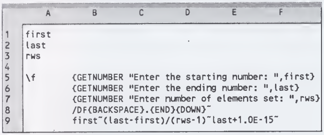
/C~.{END}{DOWN}{UP}~ copies the formula to the blank cells between the first and last number entries.

/RV{END}{DOWN}~~ changes the formulas to numbers.

Use the Range Format command to format the column of numbers as desired.

Michael G. Klein
Commack, N.Y.

The editor replies: Here's another approach that lets you specify the number of divisions of the set rather than point to cells in the worksheet:



```
        A         B         C         D         E         F
 1  first
 2  last
 3  rws
 4
 5  \f        {GETNUMBER "Enter the starting number: ",first}
 6            {GETNUMBER "Enter the ending number: ",last}
 7            {GETNUMBER "Enter number of elements set: ",rws}
 8            /DF{BACKSPACE}.{END}{DOWN}~
 9            first~(last-first)/(rws-1)~last+1.0E-15~
```

To see how this macro works, enter labels as shown and use the Range Name Labels Right command to assign the labels in column A as names for the adjacent cells of column B.

To run the macro, position the cell pointer in a blank column or in a column that contains enough blank cells to hold the sequence of values. Then press MACRO-F. Here's what the macro does:

{GETNUMBER "Enter the starting number: ",first} prompts you for a starting number and stores your entry as a value in the cell named *first*.

{GETNUMBER "Enter the ending number: ",last} prompts for an ending number and stores your entry in *last*.

{GETNUMBER "Enter number of elements in set: ",rws} prompts for the total number of values you want to generate and stores your response in *rws*.

/DF{BACKSPACE}.{END}{DOWN}~ issues a Data Fill command and assigns all the blank cells below and including the current cell as the Fill range.

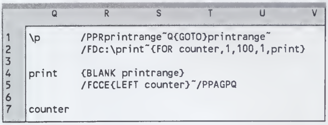
first~(last-first)/(rws − 1)~last + 1.0E − 15~ sets the start number to the value stored in *first*, the step number to the result of the expression *(last − first)/(rws − 1)*, and the stop number to slightly more than the number stored in *last*. The macro adds a little extra to the stop number to prevent problems caused by rounding errors. *1-2-3* fills the column with values.

PRINTING NUMEROUS WORKSHEETS

I recently discovered the solution to a problem that has haunted our real estate office for some time.

We are a management company with approximately 100 properties. We often create similar *1-2-3* worksheets for each location. We need to print all of these files periodically, but doing so manually is time-consuming and requires constant attention.

I solved this problem by creating a subdirectory containing each WK1 file to be printed. I then created a worksheet with the macro shown in the following figure. The macro combines and prints each file from the directory named C:\PRINT.

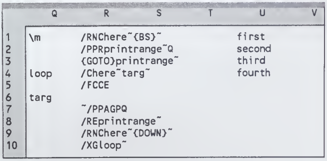


```
        Q         R         S         T         U         V
 1  \p        /PPRprintrange~Q{GOTO}printrange~
 2            /FDc:\print~{FOR counter,1,100,1,print}
 3
 4  print     {BLANK printrange}
 5            /FCCE{LEFT counter}~/PPAGPQ
 6
 7  counter
```

When you create the macro, replace the 100 in the command in cell R2 with the number of files your subdirectory contains.

Thomas A. Lithgow
VMS Realty Partners
Chicago, Ill.

The editor replies: For those who would like to accomplish the same task in *1-2-3* Release 1A, use the following macro:



```
        Q         R         S         T         U         V
 1  \m        /RNChere~{BS}~                    first
 2            /PPRprintrange~Q                  second
 3            {GOTO}printrange~                 third
 4  loop      /Chere~targ~                      fourth
 5            /FCCE
 6  targ
 7            ~/PPAGPQ
 8            /REprintrange~
 9            /RNChere~{DOWN}~
10            /XGloop~
```

To build either model, enter labels as shown. If you use Release 1A, replace the labels *first*, *second*, *third*, and *fourth* in column U with the names of files to be printed from the default directory. You can enter as many file names as you like in column U, and the macro will print each in turn.

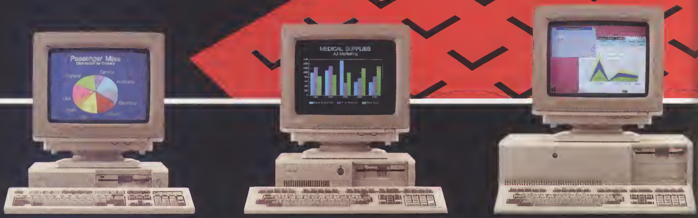
Whichever release of *1-2-3* you have, use the Range Name Labels Right command to assign the labels in column Q as names for the adjacent cells of column R. Then use the Range Name Create command to assign the name *printrange* to the area of your template that is to be printed. The *printrange* area of the template should be large enough to accommodate every worksheet you plan to print.

If you use Release 1A, place the cell pointer over the first file name in column U before you start the macro. Then, in any release, hold down the MACRO key and press M to run the macro. Release 1A users should press Escape several times to return to Ready mode after the macro stops. ■

Send Us Your Macros

If you have questions about macros, send them to us. If you have a favorite macro technique, we'd like to see it. If we use your letter in a column, we'll send you $25. Write to: Macros Editor, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

When people think you only make mainframes, you'd better have more than a good line to sell PCs.



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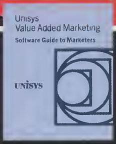

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FASTER WHAT-IF TABLES

You can calculate what-if tables more rapidly with a macro than you can with the Range What-If command.

BY DANIEL GASTEIGER

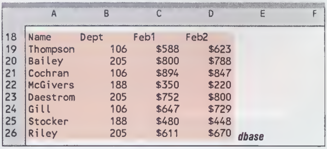
The What-If command lets you supply a list of values to substitute one by one into a collection of formulas. With each substitution, *Symphony* recalculates the formulas and returns a new outcome. Once you've created a model that represents relationships between an independent variable and one or more fixed quantities, the What-If command can generate a table of outcomes for tens, hundreds, and even thousands of values of the independent variable.

Unfortunately, the What-If command is slow. In small worksheets, the command can calculate a what-if table relatively quickly. However, in larger worksheets, particularly in those laden with formulas, calculating a what-if table can take many minutes or even hours.

If you waste significant time waiting for *Symphony* to calculate what-if tables, read on. We will generate a standard what-if table and then modify the worksheet by adding a macro that can outperform the What-If command in many circumstances.

A WHAT-IF SCENARIO

To see how a what-if table works, create the database shown in the following illustration. You needn't generate a data-entry form in a FORM window. Simply enter the labels and values directly into the worksheet cells.



	A	B	C	D	E	F
18	Name	Dept	Feb1	Feb2		
19	Thompson	106	$588	$623		
20	Bailey	205	$800	$788		
21	Cochran	106	$894	$847		
22	McGivers	188	$350	$220		
23	Daestrom	205	$752	$800		
24	Gill	106	$647	$729		
25	Stocker	188	$480	$448		
26	Riley	205	$611	$670	**dbase**	

Make your worksheet match ours by assigning a currency format with no decimal places to range C19..D26: Select MENU Format Currency, enter 0, and indicate range C19..D26.

This database contains fees charged by each of eight consultants to three departments within a single company. The fees appear as charges for the first and second weeks in February. Your databases might be larger than this one, but what-if table techniques work with databases of almost any size.

As part of your review of company expenditures by department, you wish to sum the charges made to each department during each of the two weeks. For such a small model, you might create three Criterion ranges and write six @DSUM formulas. However, for a database containing records of many departments, you face a task that is ideal for the Range What-If command.

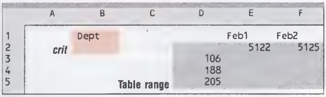
THE WHAT-IF ANALYSIS

Before you create the actual what-if table, create a Criterion range for the table to use in its database calculations. To do this, enter the label *Dept* into cell B1, then assign the name *crit* to range B1..B2. To assign the range name, select MENU Range Name Create, enter *crit*, and indicate range B1..B2. Use the same procedure to assign the name *dbase* to range A18..D26.

Create the actual what-if table by listing department numbers 106, 188, and 205 in range D3..D5. Enter the labels *Feb1* and *Feb2* into cells E1 and F1, respectively. Then enter the following formulas into the cells indicated:

Cell	**Formula**
E2	@DSUM(dbase,2,crit)
F2	@DSUM(dbase,3,crit)

Your worksheet should match the following figure:



	A	B	C	D	E	F
1		Dept			Feb1	Feb2
2	**crit**				5122	5125
3				106		
4				188		
5			**Table range**	205		

The @DSUM formula in cell E2 returns the sum of the entries in the *Feb1* field of the database; the formula in cell F2 sums the entries in the *Feb2* field. These formulas use the Criterion range as a guide to determine which field entries to sum.

Currently, the @DSUM formulas sum all of the entries from each of the two database fields in question. However, when you enter a department number into the Criterion range, the @DSUM formulas will sum only field entries whose department numbers match the criterion.

Enter *106* into cell B2, and notice that *Symphony* updates the formulas in cells E2 and F2 to sum only charges to department 106. Replace the entry in cell B2 with the department number 188; *Symphony* updates the formulas once more.

This procedure of substituting department numbers into the Criterion range and recalculating the @DSUM formulas is the procedure by which *Symphony* generates a what-if table. *Symphony* substitutes department numbers from the list in the left column of the table. After each substitution, *Symphony* recalculates the entire worksheet, then copies the results of the @DSUM formulas into the row of the what-if table that corresponds with the substituted department number.

Try it. There's no need to change the value in cell B2. Simply select MENU Range What-If 1-Way. Indicate range D2..F5 as the Table range and cell B2 as the Input cell. Almost instantly *Symphony* fills the table with charges summed by department.

THE WHAT-IF MACRO

The Range What-If command is fast in this worksheet, but let's see how slowly the command can run. Erase the table's calculations by selecting MENU Erase and indicating range E3..F5. Then enter the formula @RAND into cell A30, and copy the formula to range A30..G510. Depending on your computer, you must wait several seconds for *Symphony* to complete the copying procedure.

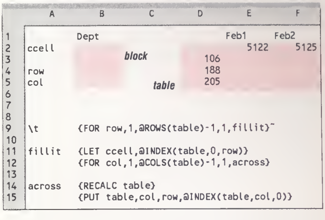
Select MENU Range What-If 1-Way, and press Return twice to accept the existing Table range and Input cell designations. Again, depending on your computer, you may wait as long as 20 seconds for *Symphony* to recalculate the table's values.

A table's calculation time increases gradually as you increase the number of formulas in the worksheet. The calculation time increases more quickly as you increase the number of values the What-If command will generate. In either case, the macro in the following worksheet can give you an edge over the What-If command.

Before you create the macro, erase cell B2 and the @RAND formulas in range A30..G510. Then enter the labels shown in range A2..B15 of the following figure. Assign the labels in range A2..A14 as names for the adjacent cells of column B: Select MENU Range Name Labels Right, and indicate range A2..A14. Also, assign the name *block* to range B2..B5 and the name *table* to range D2..F5.

The macro is ready for action. Erase range E3..F5 so that you see *Symphony* update the table, then hold down the MACRO key (Alt on most computers) and press T. Almost instantly the sums of department charges appear in the Table range.

In this nearly empty worksheet, the macro performs no better than the Range What-If command. However, if you were to enter and copy the @RAND formula into range A30..G510 as you did earlier, the macro would outrun the Range What-If command by a factor of four.


```
         A          B          C          D          E          F
 1                 Dept                            Feb1       Feb2
 2  ccell                                            5122       5125
 3                                        106
 4  row                                   188
 5  col                                   205
 6
 7
 8
 9  \t         {FOR row,1,@ROWS(table)-1,1,fillit}~
10
11  fillit     {LET ccell,@INDEX(table,0,row)}
12             {FOR col,1,@COLS(table)-1,1,across}
13
14  across     {RECALC table}
15             {PUT table,col,row,@INDEX(table,col,0)}
```

THE MACRO EXPLAINED

This macro exploits the @INDEX function and the {PUT} command—features of *Symphony* that we explored in last month's column. Refer to that column for an in-depth explanation of the techniques used in this worksheet. Here's how the macro works:

{FOR row,1,@ROWS(table) – 1,1,fillit}~ processes a FOR loop. This particular FOR loop uses the cell named *row* as its counter cell and processes the routine named *fillit* once for each row in the range named *table* (D2..F5). When the loop has run once for each row in *table*, the macro presses Return to update the display.

{LET ccell,@INDEX(table,0,row)} assigns to *ccell* the result of the formula @INDEX(table,0,row). With each pass of the loop, this formula returns a different department number from the left column of the Table range. Because *ccell* is within the Criterion range, this step serves to establish a criterion for the two @DSUM formulas in the what-if table.

{FOR col,1,@COLS(table) – 1,1,across} processes a second FOR loop. This FOR loop uses the cell named *col* as its counter and processes the routine named *across* once for each column of the what-if table. This FOR loop runs once during each iteration of the earlier FOR loop.

{RECALC table} updates the formulas in the top row of the what-if table.

{PUT table,col,row,@INDEX(table,col,0)} copies the values from the top row of the what-if table into the row of the table whose department number currently resides in the Criterion range.

Basically, the macro behaves like the Range What-If command, except that when the macro copies a value into the Criterion range, it doesn't recalculate the worksheet to determine what value should go into the table.

YOUR OWN WHAT-IF TABLES

You can adapt this macro to generate any table the Range What-If command can generate. Suppose, for example, you wish to add a column to the Table range. This column will calculate the consultants' average charges within each department for the first week in February.

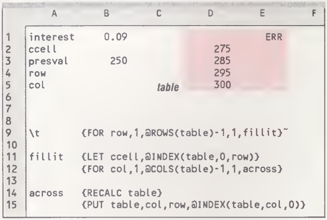
Enter the formula @AVG(dbase,2,crit) into cell G2, then extend the range named *table* to include this new column. To extend the range, select MENU Range Name Create, enter *table*, and press RightArrow Return. Simply by extending this range, you provide the macro with enough information to complete the new table.

When you press MACRO-T, *Symphony* generates new values for column G.

The example in this discussion performs calculations related to a database. What-if tables, and consequently this macro, can perform other types of calculations as well.

In designing any one-way what-if table, list values to use as variables starting in the second cell of the leftmost column of *table*. List formulas across the top row, starting in the second column of *table*. Each formula should rely in some way on the cell named *ccell*.

For example, in the following illustration *ccell* represents the desired future value of an investment:



```
        A            B           C           D           E          F

1   interest      0.09                                  ERR
2   ccell                                   275
3   presval        250                      285
4   row                                     295
5   col                         table       300
6
7
8
9   \t         {FOR row,1,@ROWS(table)-1,1,fillit}~
10
11  fillit     {LET ccell,@INDEX(table,0,row)}
12             {FOR col,1,@COLS(table)-1,1,across}
13
14  across     {RECALC table}
15             {PUT table,col,row,@INDEX(table,col,0)}
```

The annual interest rate of the investment appears in cell B1; the present value of the investment appears in cell B3. The labels in range A1..A5 identify the names of the adjacent cells of column B. The range named *table* encompasses range D1..E5, and cell E1 contains the formula @CTERM(interest/12,ccell,presval).

When you run the macro, *Symphony* lists in range E2..E5 how many months you would wait for your investment to be worth each of the amounts listed in range D2..D5.

MACRO LETTERS

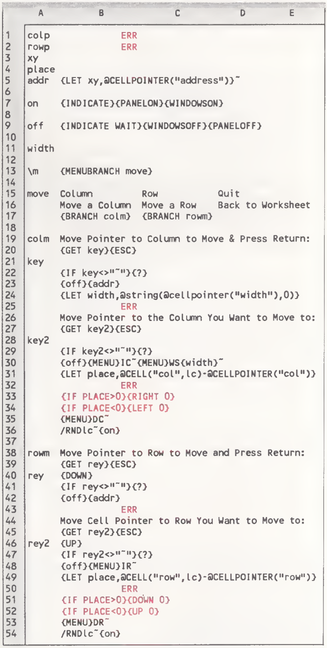
MOVING COLUMNS AND ROWS

With *SuperCalc*, moving a column or row entails as few as seven keystrokes. *Symphony* requires more than three times that many for the same process, which includes inserting a new row or column, moving the data, and deleting the old row or column.

I've created a macro that requires only six keystrokes to relocate a column or row. Although my macro does the job, a faster one must exist. How would you write such a macro?

Steven K. Orr
Fujitsu America
San Jose, Calif.

The editor replies: We wrote the following macro to move one row or column at a time. Although *SuperCalc* lets you move a range of rows or columns, we suggest that you move ranges manually with *Symphony* because creating an equivalent macro would be too complex to justify. Even the preceding macro is quite large; you should include it in a macro library only if you have a strong need for it.



```
     A          B                 C                 D         E

1   colp              ERR
2   rowp              ERR
3   xy
4   place
5   addr  {LET xy,@CELLPOINTER("address")}~
6
7   on    {INDICATE}{PANELON}{WINDOWSON}
8
9   off   {INDICATE WAIT}{WINDOWSOFF}{PANELOFF}
10
11  width
12
13  \m    {MENUBRANCH move}
14
15  move  Column          Row             Quit
16        Move a Column   Move a Row      Back to Worksheet
17        {BRANCH colm}   {BRANCH rowm}
18
19  colm  Move Pointer to Column to Move & Press Return:
20        {GET key}{ESC}
21  key
22        {IF key<>"~"}{?}
23        {off}{addr}
24        {LET width,@string(@cellpointer("width"),0)}
25                    ERR
26        Move Pointer to the Column You Want to Move to:
27        {GET key2}{ESC}
28  key2
29        {IF key2<>"~"}{?}
30        {off}{MENU}IC~{MENU}WS{width}~
31        {LET place,@CELL("col",lc)-@CELLPOINTER("col")}
32                    ERR
33        {IF PLACE>0}{RIGHT 0}
34        {IF PLACE<0}{LEFT 0}
35        {MENU}DC~
36        /RNDlc~{on}
37
38  rowm  Move Pointer to Row to Move and Press Return:
39        {GET rey}{ESC}
40  rey   {DOWN}
41        {IF rey<>"~"}{?}
42        {off}{addr}
43                    ERR
44        Move Cell Pointer to Row You Want to Move to:
45        {GET rey2}{ESC}
46  rey2  {UP}
47        {IF rey2<>"~"}{?}
48        {off}{MENU}IR~
49        {LET place,@CELL("row",lc)-@CELLPOINTER("row")}
50                    ERR
51        {IF PLACE>0}{DOWN 0}
52        {IF PLACE<0}{UP 0}
53        {MENU}DR~
54        /RNDlc~{on}
```

To see how the macro works, set column widths as follows: A–6, B–15, C–14. Enter labels as shown, but for the moment, omit the entries shown in red. Those entries are formulas that you will enter in a moment.

Use the Range Names Labels Right command to assign the labels in column A as range names for the adjacent cells of column B. Then enter the formulas listed in the following table:

FORMULA TABLE

Cell	Formula
B1	@MID(xy,1,@FIND("$",xy,1) − 1)
B2	@MID(xy,@FIND("$",xy,1) + 1,@LENGTH (xy) − @FIND("$",xy,1) − 1)
B25	+ "/RNClc~"&colp&"1.."&colp& "8192~{on}"
B32	+ "{addr}{MENU}Mlc~"&colp&"1~"
B33	+ "{IF place>0}{RIGHT "&@STRING ($place,0)&"}"
B34	+ "{IF place<0}{LEFT "&@STRING(@ABS ($place),0)&"}"
B43	+ "/RNClc~a"&rowp&"..iv"&rowp& "~{on}"
B50	+ "{addr}{MENU}Mlc~a"&rowp&"~"
B51	+ "{IF place>0}{DOWN "&@STRING ($place,0)&"}"
B52	+ "{IF place<0}{UP "&@STRING(@ABS ($place),0)&"}"

Save the macro in a library file before you run it, or you might inadvertently rearrange the macro itself. Also, make sure you've attached the Macro Library Manager add-in before you save the macro to a Macro Library file. Press the SERVICES key and select Application Attach. Highlight MACROMGR.APP, press Return, then select Quit.

Now press the SERVICES key and select Macros Save. Type a name for the library, *move* for example, and press Return. Indicate the range, A1..D54, press Return, then select No. The macro vanishes from the worksheet but remains in RAM in a macro library. *Symphony* also stores a copy of the macro library in a file in the default data directory.

To use this macro in future work sessions, you must attach MACROMGR.APP as you did earlier. Then select SERVICES Macros Load, and choose the MLB file that contains the macro. Once the macro library is in RAM, you can run the macro by pressing MACRO-M.

DATE INTERVALS BEFORE 1900

I am a genealogist and must determine the life spans of historical persons, given their birth and death dates. Using *Symphony* Release 1.0, I've been unable to come up with a way to calculate the time interval between dates prior to 1900. Is there a way for a macro to give me a person's approximate age at death in years, months, and days?

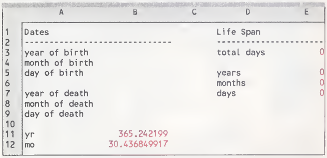
Lloyd E Sorenson
Tucson, Ariz.

The editor replies: The difficulty with this problem is in defining what a month and a year really are. The year 1984 had one more day than 1983. The two months February and March may contain as few as 59 days, while the two months July and August contain 62 days.

According to the fifteenth edition of *The New Encyclopædia Britannica*, the problem is further complicated by the fact that the Gregorian calendar dates back only to 1582. The day preceding October 15th of that year was October 4, 1582, of the old Julian calendar. People who lived during that period will be missing 10 days from their life spans if you use their Julian birth date and their Gregorian death date.

A year is precisely 365.242199 days long. If you accept this definition, then a month is one-twelfth of 365.242199. Use these numbers as the basis for a spreadsheet.

The following macro-free template calculates a close approximation of a person's life span in years, months, and days:



	A	B	C	D	E
1	Dates			Life Span	
2	--------------	--------------		--------------	--------
3	year of birth			total days	0
4	month of birth				
5	day of birth			years	0
6				months	0
7	year of death			days	0
8	month of death				
9	day of death				
10					
11	yr	365.242199			
12	mo	30.436849917			

To build the model, select MENU Width Set and adjust the widths of columns A, B, and D to 14. Enter labels as shown, omitting for now the entries shown in red. Select MENU Range Name Labels Right to assign the labels in range A3..A12 as names for the adjacent cells of column B. Assign the labels in range D3..D7 as names for the adjacent cells of column E. Now make the following entries:

Cell	Entry
B11	365.242199
B12	+ yr/12
E3	@ROUND(year of death*yr + (mo*(month of death − 1)) + day of death + 1,0) − @ROUND(year of birth*yr + (30.43684*(month of birth − 1)) + day of birth + 1,0)
E5	@INT(total days/yr)
E6	@INT((total days − (years*yr))/mo)
E7	@IF(total days − (years*yr) − (months* mo) <0,0,@INT(total days − (years*yr) − (months*mo)))

To use this template, enter the year, month, and day of birth in cells B3, B4, and B5, respectively; then enter the year, month, and day of death in cells B7, B8, and B9, respectively. Be sure to enter all the digits necessary to identify a year—1892, for example. Enter negative year values for B.C. dates and positive year figures for A.D. dates. Hats off to any genealogist regularly entering B.C. dates! ■

MACRO BASICS

WRITE FUNCTION KEYS INTO YOUR MACROS

Simple *1-2-3* macros call on function keys to speed up pointer movement, format cells, erase ranges, and retrieve files.

BY NICK DELONAS

WARD SCHUMAKER

It's hard to imagine working in a spreadsheet without the use of function keys. Some of these keys provide shortcuts to procedures available via the menus, while other keys let you perform tasks you cannot do any other way.

The function keys are even more potent when you incorporate them in your macros.

WHAT IS A MACRO?

A macro is a collection of instructions stored as labels in the worksheet. These instructions automate procedures you'd normally perform manually. Try one out:

In an empty worksheet, enter the label *My Name* in cell B1. In cell A1, enter *'\n*. Now, assign the macro a name, which usually consists of a backslash followed by a single letter, in this case *n*. You must assign a name to the first cell of every macro you write. With the pointer in cell A1, press slash, select Range Name Labels Right, and press Return. This assigns the label in cell A1 as the range name for cell B1. This label isn't part of the macro but serves to identify the macro's name.

The macro you just created resides in cell B1. To use this macro, move the pointer to cell A7, then hold down the MACRO key (Alt on most computers) and press N. The macro types the letters exactly as they appear in cell B1. Press Return to enter the characters into the current cell. Now whenever you wish to type the label *My Name* in this worksheet, simply press MACRO-N and then press Return.

Macros can simplify and expedite many worksheet tasks. A macro can, in effect, press any key you press. The macro you just created activates keys that produce alphabetic characters. However, a macro can also include instructions to press arrow keys, select menu items, and use the special function keys.

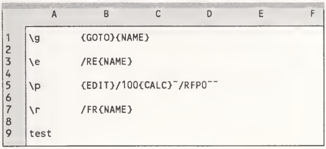
USING FUNCTION KEYS

The worksheet below contains several macros that use function keys.

To create the macros, enter the labels exactly as they appear. Remember to start by typing an apostrophe when you enter labels that begin with a backslash or a slash.

The labels in column A identify the cell names of column B. To assign these names, press slash, select Range Name Labels Right, specify range A1..A9, and press Return. You've just created four macros. Before you go any further, save the worksheet.

The macro named *\g* helps you move the pointer around the worksheet. Try it by holding down the MACRO key and pressing G. The macro presses the GOTO key, and then the NAME key. *1-2-3* reacts as if you had pressed the GOTO and NAME keys manually; a list of



	A	B	C	D	E	F
1	\g	{GOTO}{NAME}				
2						
3	\e	/RE{NAME}				
4						
5	\p	{EDIT}/100{CALC}~/RFPO~~				
6						
7	\r	/FR{NAME}				
8						
9	test					

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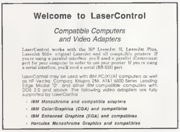

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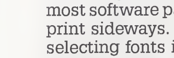

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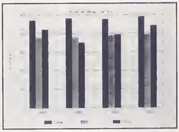

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MACRO BASICS *continued from page 36*

the worksheet's range names appears in the control panel.

Use the arrow keys to highlight *test*, then press Return. The pointer jumps directly to the cell named *test* (B9). You can quickly move the pointer to any named cell by running the macro and selecting the cell's name from the list in the control panel.

The macro named *\e* helps you erase named cells and ranges. To try it, enter *erase me* in the cell named *test* (B9). Then run the macro by pressing MACRO-E. The macro presses slash, presses R to select Range, and presses E to select Erase. Then it presses the NAME key. Point to the name *test* in the list that appears, then press Return. The label in *test* will disappear. Rerun the macro when you wish to erase another named cell or range.

> THE MACRO NAME FOR EACH KEY IS SIMPLY THE NAME OF THE FUNCTION KEY ENCLOSED IN BRACES: {EDIT}, {NAME}, {ABS}, {GOTO}, {WINDOW}, {QUERY}, {TABLE}, {CALC}, AND {GRAPH}.

The macro named *\p* divides a number by 100 and assigns the result a percent format. To try it, enter a number in the cell named *test*, and with the pointer in that cell, press MACRO-P.

The macro presses the EDIT key, then types */100*. It presses the CALC key and Return to convert this new formula to its current value and enter the result in the current cell. Finally, the macro presses slash, selects Range Format Percent, enters *0*, and presses Return to assign a percent format to the new value.

The macro named *\r* helps you to retrieve a file. Before you use this macro, make sure you've saved your worksheet. When you retrieve a file, *1-2-3* doesn't remind you to save your work. To retrieve a file, press MACRO-R.

The macro presses slash and selects File Retrieve. Then the macro presses the NAME key, and *1-2-3* displays a full-screen listing of the files in the current directory. To retrieve a file, highlight its name and press Return.

We've demonstrated macro applications of four function keys. A macro can "press" any function key except the HELP key. The macro name for each key is simply the name of the function key enclosed in braces. Thus the macro function-key names are {EDIT}, {NAME}, {ABS}, {GOTO}, {WINDOW}, {QUERY}, {TABLE}, {CALC}, and {GRAPH}. Work a little with the macros we've described, then experiment to discover how you might write more macros that exploit the function keys. ■

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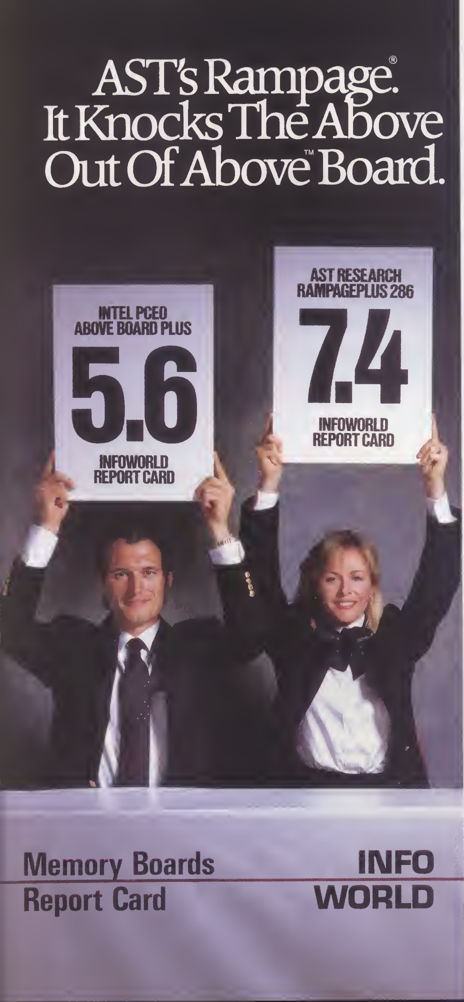

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Value	Very Good	Satisfactory
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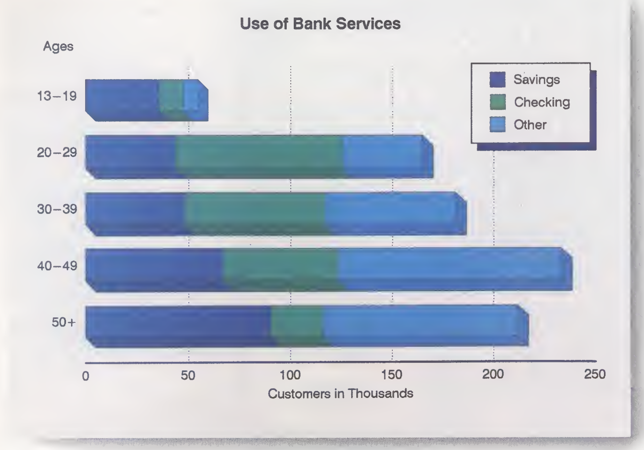

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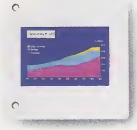

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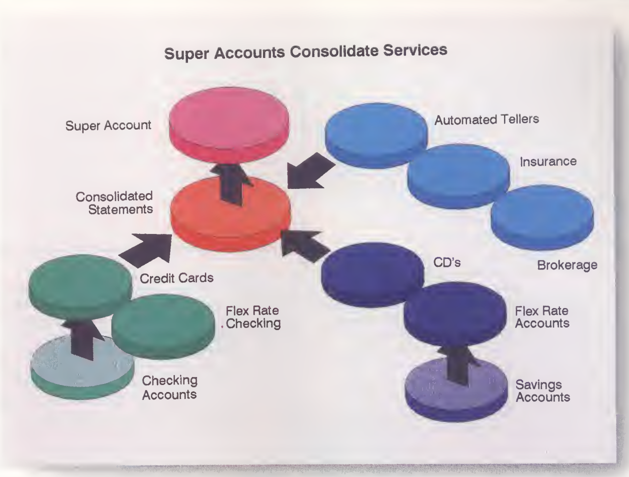

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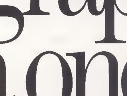
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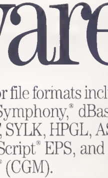

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FINANCE

INVENTORY VALUATION: THE LIFO APPROACH

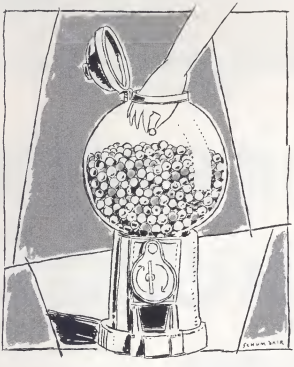
For more-accurate cost-of-goods-sold and profit figures, determine inventory values as though the newest items are sold first.

BY STEPHEN L. NELSON

Imagine that your business is selling vintage Italian sports cars. After surveying all the cars on your lot, you realize that they represent an enormous investment and that some key business decisions you'll make in the months ahead depend on the exact value of that investment. But is your inventory of cars worth what you paid to acquire it or what you would pay to replace it?

Assigning a dollar value to inventory, or inventory costing, has two purposes. The first is for calculating inventory value for your balance sheet. The second is for determining the cost of goods sold. Several costing methods exist. The costing approach you choose depends on which of these purposes you have in mind.

Two of the most popular methods for inventory costing are First In, First Out (FIFO) and Last In, First Out (LIFO). The FIFO method assumes that the first inventory item you purchase will be the first item sold; LIFO assumes the last item you purchase will sell first. In general, the FIFO approach produces a more accurate balance sheet figure for your inventory than does the LIFO method, which produces a more accurate figure for the cost of goods sold. In this article we'll examine the mechanics of these techniques, as well as the differences between them. We'll also see how you can implement a LIFO scheme with the help of a spreadsheet.



Consider your vintage sports car business. Last year you purchased a red sports car for $5,000, and this year you purchased a green sports car for $10,000. The cars are identical except for the color. You paid more for the green car because prices for Italian sports cars rose.

Suppose you sell the red car for $12,000 at the end of the current year. FIFO, as we saw, assumes that the first items purchased are the first items sold and that the last items purchased remain in inventory. In our example, then, the car you sold cost $5,000, and the car in inventory cost $10,000. It turns out that what FIFO assumes is what actually occurred: You sold the red car first and the green car is still in inventory. In fact, FIFO is sometimes chosen because it tends to match the actual flow of goods, especially when you're dealing with perishable goods.

Another advantage of FIFO is that the inventory value on the balance sheet usually approximates the replacement cost of the inventory. In our example, you purchased the red car for $5,000 and sold it for $12,000, a price that more closely reflects the current replacement value. Inventory now consists of the green car, to which FIFO assigns a $10,000 cost.

As you can see, FIFO delivers an accurate inventory value for the balance sheet. But sometimes it doesn't measure profits well, particularly when inventory costs are rising rapidly. Applying the FIFO system to your business, you would conclude that you made $7,000 in profit by selling the red car, since you bought it for $5,000 and sold it for $12,000. If you assume that you sell one of the cars—it doesn't matter which one—for $9,000, you might think that you're making a $4,000 profit. However, you can't boast a profit if you sell for $9,000 what you're cur-

---

Stephen L. Nelson, CPA, is a consultant in Redmond, Wash., and author of Using DacEasy, *published by Que Corp. (1988).*

WARD SCHUMAKER

rently buying for $10,000. Even if the car you sell is the red one, what really happened is that you bought the car for $5,000, sold it for $9,000, but must spend $10,000 to restock inventory. What FIFO calculates as a $4,000 profit is really the net effect of a $5,000 increase in inventory and a $1,000 loss on the sale of the red sports car.

LIFO, on the other hand, addresses this problem by assuming that the last items you purchase are the first items you sell. When you sell the car that you bought for $5,000, LIFO recognizes that you're now purchasing these cars for $10,000 and therefore says that the cost of each car you sell is $10,000. It then calculates the profit from the sale of the red car as $2,000, which is the $12,000 selling price minus the $10,000 purchase price. If you sell the car for $9,000, LIFO shows a loss of $1,000.

FIFO PRODUCES AN ACCURATE INVENTORY VALUE FOR THE BALANCE SHEET. LIFO PRODUCES AN ACCURATE COST OF GOODS SOLD.

To conclude this comparison of the two methods, FIFO usually produces a more accurate inventory value for your balance sheet because it values your inventory by using the most recent costs. On the other hand, LIFO, which uses the most recent costs to determine the value of what you sold, usually gives a more accurate figure for the cost of goods sold and therefore a better way to determine profits. So when you need to measure profits accurately, use LIFO. The improved earnings estimates may let you make better pricing and purchasing decisions and, in the long run, more money.

Unfortunately, applying LIFO isn't easy for some businesses. Many business textbooks demonstrate the LIFO method by making the assumption that the firm will track each unit in inventory. For instance, in the sports car business, you could assume that you sold the more expensive green car first because you bought it last and that you kept the red car in inventory since you bought it first. Remember that for the inventory-costing assumption, the actual flow of the goods doesn't matter; you're trying to get realistic figures for the balance sheet inventory and the cost of goods sold for the income statement. But what if you have hundreds or thousands of inventory items? Keeping track of specific items in order to apply the LIFO assumption can be impossible.

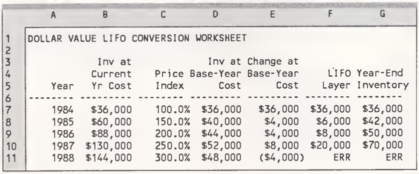
Does this mean that you can't apply LIFO if you haven't kept track of every inventory item? No, it just means that you need to use a costing-method variation called dollar-value LIFO. This approach requires only that you know the year-end inventory balances valued at their current costs and the percentage changes in inventory price levels from year to year. The next section outlines six steps required to determine your inventory value under dollar-value LIFO. Before reading on, build the worksheet by using the instructions on page 45.

SIX STEPS TO DOLLAR-VALUE LIFO

To get a better idea of how LIFO is applied in the real world, let's expand our sports car dealership. Assume that in 1984 the cost of each car from the factory in Italy was $4,000 and that it has gone up $2,000 each year. We'll call 1984 the base year, a term we'll explain later.

STEP 1: Record the current dollar value of the inventory. By the end of 1988, the cost of each car rose to $12,000. Let's assume you have 12 cars in inventory (remember, it doesn't matter which cars were purchased in which year), so your inventory is worth $144,000, as shown in cell B11 of figure 1. In 1987 each car cost $10,000, and at year's end you had 13 cars, or $130,000 of inventory. In 1986 each car cost $8,000, and you ended the year with 11 cars, or $88,000 of inventory, and so forth. Columns A and B of the worksheet in figure 1 contain labels and values that show these amounts.

In our example, we used ending-inventory balances dating back to 1984. How far back should you go when applying this method? To answer this, it may help to analyze the problem in slightly different terms. First, because of inflation, inventory, to the extent that it's *not* subject to obsolescence, increases its value just by sitting there. The purpose of dollar-value LIFO is to measure profits exclusive of the effects of this inventory-holding gain. For each previous year that you include in your model, holding gains are excluded from the current year's profit. Any existing stock that you acquired before the base year is valued at the base-year level, and the profit you calculate



```
         A         B         C         D         E         F         G
1   DOLLAR VALUE LIFO CONVERSION WORKSHEET
2
3                 Inv at              Inv at Change at
4                Current     Price Base-Year Base-Year      LIFO  Year-End
5        Year    Yr Cost     Index      Cost      Cost     Layer Inventory
6   -------- --------- -------- --------- --------- -------- --------
7        1984    $36,000    100.0%   $36,000   $36,000  $36,000   $36,000
8        1985    $60,000    150.0%   $40,000    $4,000   $6,000   $42,000
9        1986    $88,000    200.0%   $44,000    $4,000   $8,000   $50,000
10       1987   $130,000    250.0%   $52,000    $8,000  $20,000   $70,000
11       1988   $144,000    300.0%   $48,000  ($4,000)      ERR       ERR
```

FIGURE 1. Formulas in column D express each year's ending inventory value in base-year dollars. Column E formulas compute the changes in inventory values, and column F formulas convert these values to current-year dollars. Column G formulas calculate year-end inventory values for performing inventory costing using the dollar-value-LIFO method. Because modifications to the model are required when there is a decrease in inventory in base-year dollars, the column F formulas are designed to return ERR when this happens.

will be affected to a slight degree by inventory-holding gains.

STEP 2: Develop an index of price-level changes. Price-change indexes show the price changes from year to year. Probably the most well-known of such indexes is the consumer price index, which expresses the amount you and I pay for food, clothes, and other consumer goods as a ratio, comparing current-year prices to the average of prices during years 1982 to 1984. The year against which the current-year prices are compared is called the base year. For dollar-value LIFO, you must calculate an index of price-level changes that is specific to the inventory items you buy and sell. Normally, a trade association or government agency tracks and publishes an appropriate index of price-level changes. In our case, we need an index for vintage Italian sports cars.

DOLLAR-VALUE LIFO MEASURES PROFITS EXCLUSIVE OF THE EFFECTS OF INVENTORY-HOLDING GAINS.

To calculate the price index for each year after 1984, divide the cost of one car in that year's inventory by the 1984 cost. Column C contains the formulas 4000/4000, 6000/4000, and so on, up to 12000/4000 in cell C11. In other words, in 1985 the cars cost 150% of what they cost in 1984. In 1988 they cost 300% of what they cost in 1984.

STEP 3: Recalculate each year's inventory at the base year's costs. Column D contains formulas that return the ending inventory value for each year, expressed in 1984 dollars. The formulas divide the inventory at the current-year cost by the price index for the current year.

STEP 4: Calculate the portions of inventory purchased at the different yearly prices. Now that you've determined each year's inventory, expressed in base-year dollars, you can calculate the actual changes in inventory for each year. For the base year, the change is simply that year's inventory. To calculate changes for subsequent years, each formula for the change at base-year cost (column E) subtracts the previous year's inventory value at base-year cost (one row up in column D) from the value for the current year (the adjacent cell in column D).

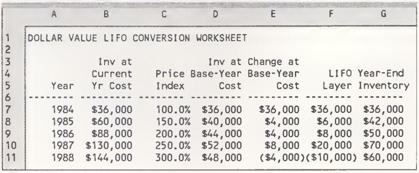
STEP 5: Convert the differently priced portions to LIFO cost layers. The next step is to express year-to-year changes in inventory value in current-year dollars. The formulas in column F do this by multiplying the change values in the adjacent column E by the price indexes in column C. The multiplication operation is included in an @IF formula that returns ERR whenever the change at base-year cost is negative, as it is in cell E11. Each formula in column G sums the range extending from cell F7 to the adjacent cell in column F.

STEP 6: Adjust for inventory liquidations. This is the trickiest step. It's not always necessary, but when it is, you must overwrite formulas in the spreadsheet with values that you compute separately.

Look carefully at the values in row 11. At the end of 1988, your inventory was worth \$144,000, in 1988 dollars. But in 1984 dollars, inventory is worth only \$48,000. That's less than the inventory was worth at the end of 1987, so the changes from 1987 to 1988, in base-year dollars, is −\$4,000. Inventory balances decreasing from one year to the next is called LIFO inventory layer liquidation. Some or all of the previous year's base-year-dollars inventory, and perhaps some of earlier years' inventories, is considered liquidated.

When a layer liquidation occurs, you must adjust the LIFO cost layer. Notice that −\$4,000 is the negative amount of half of the previous year's change in inventory. This means that for the purposes of inventory costing, you liquidate half of 1987's inventory rather than increase your inventory for 1988. To prevent the spreadsheet from containing incorrect values that you might miss, cell F11 returns ERR, causing cell G11 to return ERR, as shown in figure 1. To correct this, replace the formula in cell F11 with the value −10000, the negative of one half of 1987's LIFO layer total. This causes the formula in cell G11 to return \$60,000. The corrected version of the worksheet appears in figure 2.

Now alter the scenario a bit: Assume that 1988's ending inventory is \$132,000, and enter *132000* in cell B11. Cell E11 now returns −\$8,000. For inventory-costing purposes, you've completely liquidated 1987's inventory. In cell F11, enter *−20000*, which offsets the value in cell F10. Cell G11 returns \$50,000. Note that inventory value went from \$50,000 in 1986 to \$70,000 in 1987, but since



```
      A        B         C        D         E         F        G

1   DOLLAR VALUE LIFO CONVERSION WORKSHEET
2
3            Inv at            Inv at Change at
4           Current    Price Base-Year Base-Year     LIFO Year-End
5     Year  Yr Cost    Index      Cost      Cost    Layer Inventory
6   -------- --------- -------- --------- --------- -------- --------
7     1984   $36,000   100.0%  $36,000   $36,000  $36,000  $36,000
8     1985   $60,000   150.0%  $40,000    $4,000   $6,000  $42,000
9     1986   $88,000   200.0%  $44,000    $4,000   $8,000  $50,000
10    1987  $130,000   250.0%  $52,000    $8,000  $20,000  $70,000
11    1988  $144,000   300.0%  $48,000   ($4,000)($10,000) $60,000
```

FIGURE 2. The worksheet shown in figure 1 is now corrected to account for the decrease in inventory in base-year dollars. Since the negative value in cell E11 offsets exactly half of the value in cell E10, you enter in cell F11 the value that offsets half of the value in cell F10.

you've completely liquidated 1987 inventory, 1988 inventory is rolled back to the 1986 level.

Enter *120000* in cell B11. Cell E11 returns −$12,000, exactly enough to offset the changes in 1987 *and* 1986. Thus, in cell F11 you enter *−28000*, the value that offsets the 1987 and 1986 LIFO layers. Cell G11 returns $42,000, which is also the 1985 ending inventory. Finally, enter *108000* in cell B11. Cell E11 returns −$16,000, enough to offset the changes from 1985 to 1987. You must therefore enter *−34000* in cell F11. Cell G11 returns $36,000; inventory is rolled back to the base year.

In practice, you probably won't get values that are this easy to work with. Enter *119000* in cell B11. The result of the formula in cell E11 is −$12,333.33333, although the cell displays *($12,333)*. You could say that −12,000 of that amount offsets the $8,000 in cell E10 and the $4,000 in cell E9. The remaining amount offsets part of the 1985 inventory. Multiply −333.33333 by the 1985 price index to compute the exact amount that is offset. Enter the formula −28000−(E11+12000)*C8 in cell F11; it returns −$27,500. Now cell G11 returns $42,500.

As you can see, this spreadsheet does only part of your work. Whenever you see a negative change in the inventory value expressed in base-year dollars, you'll have to determine the appropriate LIFO layer cost using a pad and pencil or a hand-held calculator.

HOW TO USE THE RESULTS

Now that you've determined the inventory value for 1988 based on the LIFO method, use that amount as the inventory balance on your balance sheet. Then calculate the value of the cost of goods sold by using the standard accounting formula:

> Beginning Inventory + Purchases −
> Ending Inventory = Cost of Goods Sold

Beginning inventory, of course, is equal to the prior year's ending inventory. Assuming that your 1988 purchases amounted to $430,000, your 1988 cost of goods sold is $70,000 + $430,000 − $60,000 = $440,000.

You can use this worksheet in the future. Suppose that in 1989 the cost of each car goes up another $2,000 and that that year's ending inventory is $196,000. Enter *1989* in cell A12, *196000* in cell B12, and *14000/4000* in cell C12. Assign the appropriate formats to cells A12 and C12. Then copy range D10..G10 to cell D12. Make sure that you don't copy entries from a row in which you've replaced the LIFO layer formula with a value you've computed separately.

If there is a layer liquidation two years in a row, the value of the change at base-year cost offsets whatever wasn't offset from the two prior years, then some or all of the change from the year before that, and so on. Determine the LIFO layer accordingly.

Dollar-value LIFO is ideal for managerial accounting and is acceptable for tax accounting and financial accounting. Keep in mind, however, that the federal income tax laws and the accounting standards that apply to LIFO inventory accounting are complex. You must review them in depth with your auditors and tax advisors before using these approaches for tax or financial accounting. ■

HOW TO SET UP THE WORKSHEET

1. Default settings

Format: Currency 0

1-2-3: /Worksheet Global Format Currency, enter 0
Symph: MENU Settings Format Currency, enter 0, select Quit

2. Individual column widths

Column	Width
B	10
D	10
E	10

For example, to set the width of column B, place the cell pointer in column B

1-2-3: /Worksheet Column Set-Width, enter 10
Symph: MENU Width Set, enter 10

3. Cell formats

Format	Range
General	A7..A11
Percent 1 (*Symph*: % 1)	C7..C11

For example, to set the format for range A7..A11 in

1-2-3: /Range Format General, specify range A7..A11
Symph: MENU Format General, specify range A7..A11

4. Labels

Enter all the labels shown in rows 1 to 5 of figure 1. Enter an apostrophe and eight hyphens in cell A6. Copy cell A6 to cell C6 and to range F6..G6. Enter an apostrophe and nine hyphens in cell B6. Copy cell B6 to range D6..E6.

Right-align labels in rows 3 to 5,

1-2-3: /Range Label Right, specify range A3..G5
Symph: MENU Range Label-Alignment Right, specify range A3..G5

5. Values

Enter the values shown in range A7..B11 of figure 1.

6. Enter and copy formulas

Cell	Formula
C7	4000/4000
C8	6000/4000
C9	8000/4000
C10	10000/4000
C11	12000/4000
D7	+B7/C7

Copy cell D7 to range D8..D11.

Cell	Formula
E7	+D7
E8	+D8−D7

Copy cell E8 to range E9..E11.

Cell	Formula
F7	@IF(E7>=0,E7*C7,@ERR)
G7	@SUM(F$7..F7)

Copy range F7..G7 to range F8..F11.

ACCOUNTING

FINANCIAL FORECASTS THAT COMPUTE DEBT EXPENSE

If your business must maintain a minimum level of on-hand cash, this template can help you forecast interest costs.

BY CHARLES W. KYD

In order to cover the capital purchases your firm has planned for this spring, you will have to borrow $100,000 in June. Presuming the interest rate is 12%, you'll have to borrow an additional $1,000 in June to pay interest on the debt. Then you'll have to borrow $10 more to pay interest on the additional $1,000, $.10 to pay interest on the additional $10, and so on.

What you need is a method of computing your future borrowing needs and debt levels that avoids circular calculation errors. Until now, most forecasts I've seen calculate interest on the loan balance for the previous month rather than on the balance for the current month. But this can lead to inaccurate forecasts. For example, if you pay off that $100,000 loan in July, this technique would put the interest charges of $1,000 in July and August rather than in June and July. As you can see, this technique distorts the forecast, particularly when there are large swings in the loan balance.

A better approach is to calculate directly the change in the operating loan needed to account for both principal and interest.

THE DEBT-CALCULATING SPREADSHEET

The spreadsheet discussed in this article contains sections resembling a standard income statement, a balance sheet, and a cash flow report. Refer to the instructions in the box on page 48 to create the worksheet. The values printed in red in the figures are the results of formulas, while those printed in black are entered directly. You may have created similar spreadsheets in the past. As usual, the logic behind most of the formulas is self-explanatory. What makes this spreadsheet unique is that the values for the operating loan, row 42, are computed rather than entered by hand. The formulas for this category determine the amount of money you'll need to borrow to maintain the minimum bank balance you entered in cell C2.

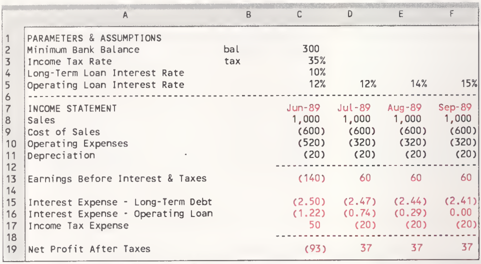
Figure 1 shows the Parameters and Assumptions section and the Income Statement section of the worksheet. Note that all dollar amounts are in thousands. This firm has determined that it must maintain a minimum cash balance of $300,000, so we enter *300* in cell C2. The tax rate is currently 35%, the interest rate for the firm's long-term debt is 10%, and the rate at which the firm can borrow money will be 12% in June and July, 14% in August, and 15% in September.

In the income statement, formulas in row 13 adjust sales by the expenses associated with sales, giving earnings before interest and taxes. Formulas in row 19 adjust the row 13 values by two types of interest and by income tax expense, giving net profits. Note that, because the interest expenses range from the hundreds to the single thousands, rows 15 and 16 are formatted to show two decimal places.

Figure 2 shows a pro forma balance sheet. Rows 21 to 32 contain the "left side" categories, or assets. Rows 41 to

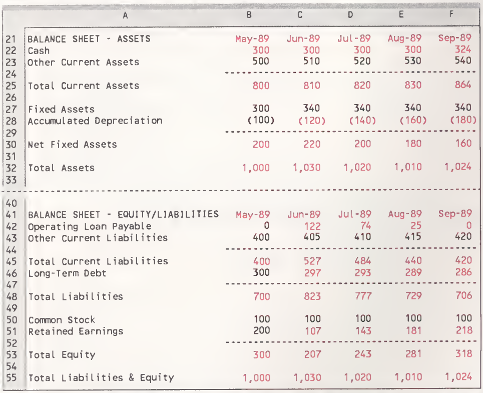
WARD SCHUMAKER

Charles W. Kyd is the author of Financial Modeling Using 1-2-3 *(Osborne/McGraw-Hill, 1986) and a consultant in Seattle.*



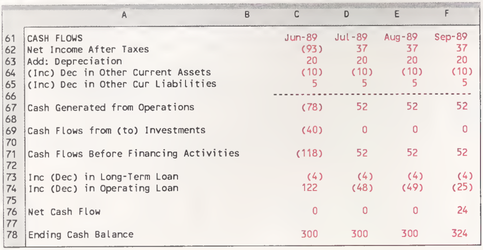
	A	B	C	D	E	F
1	PARAMETERS & ASSUMPTIONS					
2	Minimum Bank Balance	bal	300			
3	Income Tax Rate	tax	35%			
4	Long-Term Loan Interest Rate		10%			
5	Operating Loan Interest Rate		12%	12%	14%	15%
6						
7	INCOME STATEMENT		Jun-89	Jul-89	Aug-89	Sep-89
8	Sales		1,000	1,000	1,000	1,000
9	Cost of Sales		(600)	(600)	(600)	(600)
10	Operating Expenses		(520)	(320)	(320)	(320)
11	Depreciation		(20)	(20)	(20)	(20)
12						
13	Earnings Before Interest & Taxes		(140)	60	60	60
14						
15	Interest Expense - Long-Term Debt		(2.50)	(2.47)	(2.44)	(2.41)
16	Interest Expense - Operating Loan		(1.22)	(0.74)	(0.29)	0.00
17	Income Tax Expense		50	(20)	(20)	(20)
18						
19	Net Profit After Taxes		(93)	37	37	37

FIGURE 1. Unlike most pro forma income statements, this one reflects interest expense for the current month rather than the previous month. The operating loan formula in the Balance Sheet section (figure 2) makes it possible to calculate this expense while avoiding circular calculation errors. The values printed in red are the results of formulas, those in black are entered directly.



	A	B	C	D	E	F
21	BALANCE SHEET - ASSETS	May-89	Jun-89	Jul-89	Aug-89	Sep-89
22	Cash	300	300	300	300	324
23	Other Current Assets	500	510	520	530	540
24						
25	Total Current Assets	800	810	820	830	864
26						
27	Fixed Assets	300	340	340	340	340
28	Accumulated Depreciation	(100)	(120)	(140)	(160)	(180)
29						
30	Net Fixed Assets	200	220	200	180	160
31						
32	Total Assets	1,000	1,030	1,020	1,010	1,024
33						
40						
41	BALANCE SHEET - EQUITY/LIABILITIES	May-89	Jun-89	Jul-89	Aug-89	Sep-89
42	Operating Loan Payable	0	122	74	25	0
43	Other Current Liabilities	400	405	410	415	420
44						
45	Total Current Liabilities	400	527	484	440	420
46	Long-Term Debt	300	297	293	289	286
47						
48	Total Liabilities	700	823	777	729	706
49						
50	Common Stock	100	100	100	100	100
51	Retained Earnings	200	107	143	181	218
52						
53	Total Equity	300	207	243	281	318
54						
55	Total Liabilities & Equity	1,000	1,030	1,020	1,010	1,024

FIGURE 2. The operating loan balances, row 42, result from long formulas that calculate the amount needed to satisfy other financial obligations while also paying the interest expense on the loan itself.



	A	B	C	D	E	F
61	CASH FLOWS		Jun-89	Jul-89	Aug-89	Sep-89
62	Net Income After Taxes		(93)	37	37	37
63	Add: Depreciation		20	20	20	20
64	(Inc) Dec in Other Current Assets		(10)	(10)	(10)	(10)
65	(Inc) Dec in Other Cur Liabilities		5	5	5	5
66						
67	Cash Generated from Operations		(78)	52	52	52
68						
69	Cash Flows from (to) Investments		(40)	0	0	0
70						
71	Cash Flows Before Financing Activities		(118)	52	52	52
72						
73	Inc (Dec) in Long-Term Loan		(4)	(4)	(4)	(4)
74	Inc (Dec) in Operating Loan		122	(48)	(49)	(25)
75						
76	Net Cash Flow		0	0	0	24
77						
78	Ending Cash Balance		300	300	300	324

FIGURE 3. This statement of cash flows shows the changes in the operating loan needed so that the ending cash balance does not fall below the minimum cash balance specified in cell C2.

55 contain the "right side" categories, or equity and liabilities. For space reasons, several empty rows are not shown. The monthly balances for the operating loan are calculated by formulas on row 42. These formulas are explained in the next section. Since the projected interest rate for June and July is 12%, and since one-twelfth of 12% is 1%, the operating loan interest expense values in cells C16 and D16 (figure 1) are exactly 1% of the loan amounts in cells C42 and D42.

The statement of cash flows, shown in figure 3, explains how transactions in figures 1 and 2 have affected cash. This firm expects to suffer a business loss and to invest $40,000 (cell C69) in fixed assets in June. To compensate for these cash drains, the forecast assumes that the company will borrow $122,000 (cell C74), bringing the ending cash balance to the desired level of $300,000 (cell C78). During the remaining months of the forecast, profits on sales allow the company to pay off the operating loan. By September, when the loan is paid off, the company starts to experience a positive cash flow, adding $24,000 (cell F76) to its coffers.

THE OPERATING LOAN FORMULA

The most complicated formulas in the spreadsheet are those in range C42..F42, and they bear some explanation. These formulas are based on a simple equation. Before looking at the equation, let's define the variables:

C = cash flow for the month in question, which is the change in the cash account on the balance sheet

E = earnings before taxes and interest on new oper-

HOW TO SET UP THE WORKSHEET

1. Default settings

Recalculation: Manual

1-2-3: /Worksheet Global Recalculation Manual
Symph: MENU Settings Recalculation Method Manual Quit

Format: , 0 (*Symph:* Punctuated 0)

1-2-3: /Worksheet Global Format, type a comma, enter 0
Symph: MENU Settings Format Punctuated, enter 0, select Quit

2. Individual column widths

A 35

Place the cell pointer in column A, select

1-2-3: /Worksheet Column Set-Width, enter 35
Symph: MENU Width Set, enter 35

3. Cell formats

Format	Range
Date 3	C7..F7, B21
Percent 0 (*Symph:* % 0)	C3..F5
,2 (*Symph:* Punctuated 2)	C15..F16

For example, to set the format for range C7..F7, select

1-2-3: /Range Format Date 3, specify range C7..F7
Symph: MENU Format Date 3, specify range C7..F7

4. Labels

Enter all the labels shown in figures 1, 2, and 3. Enter a backslash and a hyphen (\-) in cell A6 and copy cell A6 to ranges B6..F6, C12..F12, C18..F18, B24..F24, B29..F29, B44..F44, B47..F47, B52..F52, and C66..F66.

5. Values

Enter all the values printed in black in figures 1, 2, and 3.

6. Range names

Names	Range
bal	C2
tax	C3

To assign these names, press slash (*Symph:* MENU) Range Name Labels Right, and specify range B2..B3.

7. Enter and copy formulas

Cell	Formula
C7	@DATE(89,6,1)
D7	@DATE(89,7,1)
E7	@DATE(89,8,1)
F7	@DATE(89,9,1)

Copy range C7..F7 to cell C21.

Cell	Formula
C13	@SUM(C8..C11)
C15	-B46*$C4/12
C16	-C42*C5/12
C17	(-C13-C15-C16)*$tax
C19	@SUM(C13..C17)

Copy range C13..C19 to range D13..F13.

B21 @DATE(89,5,1)

Copy range B21..F21 to cell B41.
Copy range C21..F21 to cell C61.

B22 @ROUND(B55-B23-B30,2)

Copy cell B22 to range C22..F22.

B25 @SUM(B22..B23)

Copy cell B25 to range C25..F25.
Copy range B25..F25 to each of these cells: B30, B45, B48, and B53.

C28 +B28+C11

Copy cell C28 to range D28..F28.

B32 +B25+B30

Copy cell B32 to range C32..F32.

C42 +B42+@MAX(($bal-B22
-@SUM(C63..C66,C69,C73)
-(C13+C15-B42*C5/12)*
(1-$tax))/(1-C5/12*
(1-$tax)),-B42)

Copy cell C42 to range D42..F42.

C46 +B46-(C15+6)

Copy cell C46 to range D46..F46.

C51 +B51+C19

Copy cell C51 to range D51..F51.

B55 +B53+B48

Copy cell B55 to range C55..F55.

Cell	Formula
C62	+C19
C63	-C11
C64	+B23-C23
C65	+C43-B43
C67	@SUM(C62..C65)
C69	+B27-C27
C71	@SUM(C67..C69)
C73	+C46-B46
C74	+C42-B42
C76	@ROUND(@SUM(C71..C74),2)
C78	@IF(@ROUND(B22+C76-C22,2)<>0, "Error",C22)

(In 1-2-3 Release 1A replace "Error" in the formula in cell C78 with @ERR.)

Copy range C62..C78 to range D62..F62.
Press the CALC key.

ating debt, but including interest on operating debt from previous months

i = current month's interest rate on operating debt

D = month's increase or decrease in operating debt compared with previous month

t = income tax rate

O = other adjustments to net income used to calculate cash flows, such as depreciation, changes in inventory, and so on.

To determine the amount of money you need to borrow to maintain a desired monthly cash flow, solve this equation for *D*:

$$D = \frac{C - O - E(1-t)}{1 - i(1-t)}$$

Stated in words, this formula says that the change in debt is equal to the change in cash flow, less adjustments, less earnings adjusted by the tax rate, divided by one minus the operating-debt interest rate and adjusted by the tax rate.

To see how the equation is used in the spreadsheet, we'll focus on only the formula in cell C42. The equation is represented by the middle portion of the formula:

```
($bal−B22−@SUM(C63..C66,C69,C73)−
  (C13+C15−B42*C5/12)*(1−$tax))/
  (1−C5/12*(1−$tax))
```

The expression *$bal−B22* represents the variable *C*. It subtracts the month's cash value from the desired minimum cash balance. The @SUM expression represents *O*. The expression *(C13+C15−B42*C5/12)* calculates *E*. It takes earnings before interest and taxes (cell C13), offsets it with interest on long-term debt (the negative value in cell C15), and then subtracts the previous month's loan balance (cell B42) multiplied by one twelfth of the interest rate (C5/12). The expression *(1−$tax)* represents *(1−t)*. These four expressions make up the upper half of the fraction. They are encased in parentheses and followed by a division symbol (/).

C5/12 is one month's interest, so *1−C5/12* represents *1−i*. This is multiplied by *(1−$tax)*, which completes the bottom half of the fraction.

This section of the formula is included in an @MAX expression, so its result is not greater than the negative of the previous month's balance, in the cell to its left. That is, the formula returns the repayment amount, which is never higher than the outstanding balance.

The result of the @MAX expression is added to the previous month's balance. In June, when there is a loss on sales (cell C13) and a drain on cash (cell C27), the @MAX expression returns 122, so the operating loan goes from 0 to 122. In July there is a profit on sales (cell D13) and the firm is able to repay part of the loan. The @MAX expression in the formula in cell D42 returns −48 and the operating loan goes from 122 to 74. ■

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8 WAYS TO AVOID WORKSHEET ERRORS

BY STEVEN E. MILLER

Use these techniques to raise a flag when something goes wrong.

WE ALL HOPE IT WON'T HAPPEN TO US, BUT BUILDING an error into a spreadsheet is almost inevitable. The problem can be as innocent as an incorrect value entered into a cell or as insidious as an inaccurate cell reference in an @SUM function. Unless you like to live dangerously, the best way to avoid errors is to incorporate some error checking into your worksheets. This article describes eight simple techniques that can help you identify and eliminate worksheet errors.

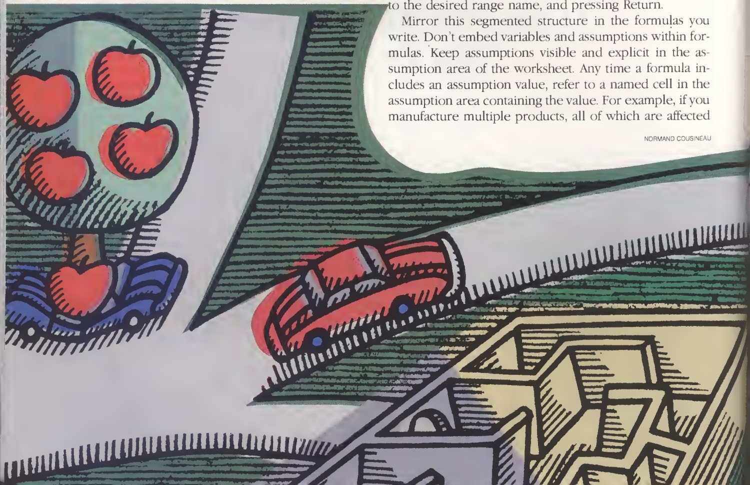
Like anything else, error checking has its price. It takes time and effort, and it uses computer memory. In addition, some of the techniques described may result in slower worksheet calculations. But if you base business decisions on the worksheets you create, the extra work, the memory overhead, and the slight performance degradation are justified. Many of the techniques described signal when something is wrong in your spreadsheet. It is up to you to pay attention to these signals and correct the problem.

1

ORGANIZE A WORKSHEET BY FUNCTION

Separate your worksheet into functional areas. Create distinct areas for a worksheet title, calculation assumptions, user input, formulas, and results. Use the Range Name Create command to assign a descriptive name, such as *input-area*, to the top-left cell in each worksheet section. Move among sections by pressing GOTO, NAME, pointing to the desired range name, and pressing Return.

Mirror this segmented structure in the formulas you write. Don't embed variables and assumptions within formulas. Keep assumptions visible and explicit in the assumption area of the worksheet. Any time a formula includes an assumption value, refer to a named cell in the assumption area containing the value. For example, if you manufacture multiple products, all of which are affected



NORMAND COUSINEAU

by a wholesale discount rate, enter the discount rate once in the assumption area, and then refer to the cell containing this entry in each product formula. This makes it unlikely that you'll enter an erroneous discount rate in a product formula. Using additional range names requires more memory, but unless your spreadsheet is quite large, the safety factor that range names provide justifies the extra memory required.

You can also reduce errors by entering a label adjacent to the cells containing important data. The label should describe the source of the data and the units (thousands, millions, etc.) involved.

2

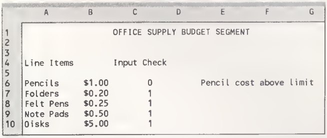
INCORPORATE LIMIT CHECKING

Test user input with limit-checking formulas to ensure that the input is within predictable limits. Usually a range of values can be assigned to a given input. For example, common sense dictates that the price per pencil in your supplies budget be about 10 cents. But a slip of the finger during data entry can move the decimal point over a place. If this happens, you end up with pencils costing a dollar (see figure 1). Transpositional entry errors are also common, for example, entering 91 in a cell instead of 19.

Limit-checking formulas that test cell contents for an upper and a lower value are easy to write. To test whether our pencil line item is within an acceptable range, assign the name *pencils* to the cell containing the value representing the cost of a pencil. In a cell immediately to the right, enter the following formula:

+pencils>0#AND#pencils<.10

In our example, cell B6 is named *pencils*, and cell C6 contains the formula. This formula determines whether the cost of a pencil is greater than zero and is less than 10 cents. If the cost falls within these limits, the condition described by the formula is true, and the formula returns a one. If the condition described is false, the formula returns a zero.



	A	B	C	D	E	F	G
1			OFFICE SUPPLY BUDGET SEGMENT				
2							
3							
4	Line Items		Input Check				
5							
6	Pencils	$1.00	0		Pencil cost above limit		
7	Folders	$0.20	1				
8	Felt Pens	$0.25	1				
9	Note Pads	$0.50	1				
10	Disks	$5.00	1				

FIGURE 1. Logical formulas in column C test the values entered in column B to determine whether they are within specified upper and lower limits. If the values in B are within limits, the conditions described by the formulas in C are true, and each returns a one. If the conditions are not true, the formulas return a zero. Here an input error has been made in the unit cost of the line item *Pencils*. A zero is returned in the input check column adjacent to this line item. In column E logical formulas are combined with @IF functions to return text error messages.

Notice that the formula has two parts. The part to the left of the logical operator #AND# tests if the value in the cell named *pencils* is greater than zero. The part to the right tests if the value in the range *pencils* is less than 10 cents. The logical operator #AND# connects the two parts and makes the truth of the entire statement dependent upon the truth of each part.

If you include a column of input-testing formulas in your worksheet, you can quickly scan it for formulas that return a zero rather than a one. This will alert you to worksheet inputs that exceed your specified limits.

If you're ambitious, embed limit-checking formulas in @IF functions. This enables you to provide more-explicit error messages. For example, the following formula will return a blank space if the value in the cell named *pencils* is greater than zero and less than 10 cents. If the limits have been violated, the @function will return a message

indicating that the tested value is above or below the limits:

```
@IF(pencils<0,"Pencil cost below limit",
  @IF(pencils>.10,"Pencil cost above limit",""))
```

In our example, this formula resides in cell E6. Since formulas of this type use significant amounts of memory and they slow recalculation, use them sparingly to test critical input values. You cannot use a string-returning formula in *1-2-3* Release 1A.

3

LOCATE INCONSISTENT RESULTS WITH LINE GRAPHS

Use line graphs to detect radical shifts in the pattern of underlying numbers. A graph can quickly represent any series of related numbers, such as projected monthly gross revenue. Don't worry about titles or legends; nothing fancy is needed. You're looking for sudden jumps or other pattern-breaking anomalies. The spike in the middle of a projected cost graph may indicate that you have made a mistake while entering projected cost numbers. A graph pattern provides a quick visual indication of the relationship among the numbers.

4

USE WIDTHS AND FORMATS FOR VISUAL FEEDBACK

Use *1-2-3* and *Symphony*'s formatting and column-width features for visual clues. For example, if you know that all numbers in a particular range will be whole numbers no larger than 999, narrow the columns that contain these numbers to four characters. Any number that uses more than three digits will be too wide for the column and will appear as a series of asterisks, thereby tipping you off to a potential error. Since *1-2-3* and *Symphony* include a space in each column, the column-width settings you use will always be one character wider than the maximum number of characters you are testing.

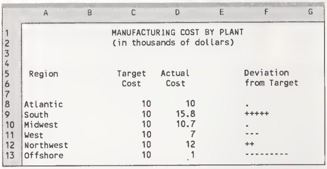
You can also use the +/− format (in *Symphony*, the Bar-Graph format) for visual indicators (see figure 2). If you have a column of numbers, all of which should be close to a target value, enter in an adjacent column a formula that subtracts the target value from each number in the column. For example, in figure 2 cell F8 contains the formula +D8−C8. This formula is copied to range F9..F13. Give the cells containing the subtraction formulas in range F8..F13 the +/− (in *Symphony*, Bar-Graph) format. Numbers whose integer values equal the target value are displayed as dots. Those that exceed the target are displayed as plus signs. Those below the target are displayed as minus signs. Long strings of plus or minus signs indicate large deviations from target values within column width limits.

5

USE RANGE NAMES FOR IMPORTANT CELLS

Assign range names to cells containing important values. This not only clarifies the meaning of formulas but also helps keep formulas accurate. It's a lot easier to interpret and validate the formula +totsales−totcosts than the formula +A457−C783. In addition, you are less likely to make a mistake when entering a range name than when entering a cell address.

Troubleshooting formulas provides another reason to make liberal use of range names. When an error arises in a worksheet, assign the Text format (in *Symphony*, Literal) to formula cells. This causes formulas to be displayed directly on the worksheet. (You'll probably have to widen column widths to see complete formulas.) By using the Text format and including range names in your formulas, you can identify calculation errors more easily.



```
      A         B         C         D         E         F         G
 1                      MANUFACTURING COST BY PLANT
 2                      (in thousands of dollars)
 3
 4
 5    Region            Target    Actual              Deviation
 6                       Cost      Cost               from Target
 7
 8   Atlantic              10        10               .
 9   South                 10      15.8               +++++
10   Midwest               10      10.7               .
11   West                  10         7               ---
12   Northwest             10        12               ++
13   Offshore              10        .1               ---------
```

FIGURE 2. The +/− format (in *Symphony*, BarGraph) can be used to indicate deviation from a norm. Formulas subtracting target cost from actual cost are entered in column F, then assigned the +/− (in *Symphony*, BarGraph) format. Actual costs above target costs display as strings of plus signs; actual costs below target, as strings of minus signs. A dot is displayed when integer values of target and actual costs are the same. Long strings indicate large deviations from target values. String length is limited by column width.

6

USE ABSOLUTE REFERENCES FOR RANGE NAMES

Make range names absolute. Most people don't realize that a range name is a relative reference. When you copy a formula that contains a range name, the range referenced in the copied version is not the same as the range referenced in the original formula.

To keep the cell coordinates of a range from changing, you must make the range name absolute by preceding it with a dollar sign. For example, assume that cell A1 contains the formula @SUM(sales) and *sales* is the name of range B1..C1. Copying the formula from cell A1 to cell A2 creates a formula that reads @SUM(B2..C2). The range argument in the @SUM formula has changed. If the original formula read @SUM($sales), the copied version would remain identical to the original.

7

CONTROL ACCESS WITH WORKSHEET PROTECTION

Use worksheet protection to prevent changes to cell contents and limit access to certain cells. When you select /Worksheet Global Protection Enable (in *Symphony*, SERVICES Settings Global-Protection Yes), you cut off access to the entire worksheet. To gain access to a protected cell or range, you must turn off global protection or selectively unprotect that cell or range with the Range Unprotect command (in *Symphony*, Range Protect Allow-Changes). By limiting access to only those cells used for data input, you reduce the chances of overwriting a formula. You also make it difficult to change the assumptions built into your calculations.

8

TEST YOUR MODEL WITH EXTREME DATA

Test each part of your worksheet before assuming it's error-free. The first step is to input predictable data and look for expected results. For example, if you leave everything constant while raising costs 5%, you know something is wrong if your model indicates that net profit is up 30%.

After you've run through a half-dozen of these common-sense tests, it's time for more-extreme data. Adjust your assumptions and data to reflect the maximum values you expect each to attain. Now check the formula results. Readjust your assumptions and data to reflect the smallest potential values. Check the formulas. Do these results contain any surprises? If so, investigate the logic used in the formulas that return suspicious results. ■

Steven E. Miller, formerly editor in chief of LOTUS, *is a management consultant based in Cambridge, Mass.*

MANAGE THOSE FILES

You can lighten your file-management load with these simple *1-2-3* commands.

BY PETER G. AITKEN

Since saving and retrieving files are among the first tasks a *1-2-3* novice learns, it's safe to assume that you are familiar with the File menu. But have you ever used a wild card to retrieve a file or tried to combine a portion of one file into another? Do you know about the File commands that save you the trouble of exiting to DOS to accomplish file- and data-management chores? If not, read on for a review of each option on the File menu shown in figure 1.

Many of the File commands prompt you for a file name, which consists of two parts: a one-to-eight-character descriptive name and a three-character file-name extension. You select the file name. *1-2-3* automatically supplies the appropriate file-name extension: WK1 (in *1-2-3* Release 1A, WKS) for a worksheet file, PRN for a print file, and PIC for a graph file.

File names and extensions can contain any combination of letters and numbers, plus the underscore character. *1-2-3* Release 2/2.01 accepts these additional characters: ! @ # $ % ^ & ( ) − { } ~ ' ‘ The following are examples of valid file names:

SALESFIG.WKS (*1-2-3* Release 1A worksheet file)
A5.PRN (print file)
4-4-88.PIC (graph file)
COSTS{2}.WK1 (*1-2-3* Release 2/2.01 worksheet file)

RETRIEVING WORKSHEETS

When you select /File Retrieve, *1-2-3* displays a list of all worksheet files in the current directory, as well as the names of all the other subdirectories. To select a file, highlight the file name and press Return. *1-2-3* loads the file into memory and displays it on the screen. To get a list of the files in any listed subdirectory, highlight the subdirectory name and press Return. To select a file in that subdirectory, highlight the file name and press Return. Alternatively, you can type the file name and press Return.

1-2-3 file lists appear on one line. If you have more files and subdirectories than fit across the line, use the arrow keys to scroll the pointer through the list. For a full list like the one in figure 2, press the NAME key and use the arrow keys to move the pointer through the list. The name, size, and time and date of creation of the highlighted file appear at the top of the list.

When you are retrieving a worksheet, you can use the two wild-card characters, the question mark and the asterisk, to restrict the files listed. The question mark stands for any single character; the asterisk stands for a series of characters. For example, if you had a disk with files named INV.WK1, INV1.WK1, and INV_JUNE.WK1, INV*.WK1 causes all three files to be listed, whereas INV?.WK1 lists only INV1.WK1.

Here are some examples of how you can use wild-card characters:

. instructs *1-2-3* to display all files regardless of their names and file-name extensions.

*.WK? instructs *1-2-3* to display all files with a WK extension followed by any single character.

????.PRN instructs *1-2-3* to display all files with a four-character name and a PRN extension.

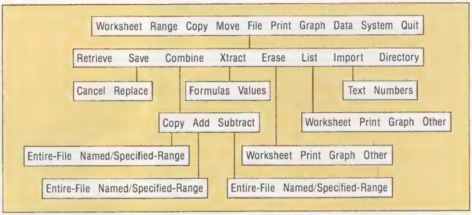
INV*.WK1 instructs *1-2-3* to display all *1-2-3* Release 2/2.01 worksheet files whose names begin with INV.

Note that the appearance of a file name doesn't mean you can retrieve the file. If you try to retrieve a PRN file, for example, you'll get the error message *Not a valid worksheet file.* You must select /File Import to retrieve a PRN file.

Peter G. Aitken wrote about the Print menu in the October issue.

TERRY ALLEN

A BEGINNER'S GUIDE



Worksheet Range Copy Move File Print Graph Data System Quit
Retrieve Save Combine Xtract Erase List Import Directory
Cancel Replace
Formulas Values
Text Numbers
Copy Add Subtract
Worksheet Print Graph Other
Entire-File Named/Specified-Range
Worksheet Print Graph Other
Entire-File Named/Specified-Range
Entire-File Named/Specified-Range

FIGURE 1. The *1-2-3* Release 2/2.01 File menu

If you use *1-2-3* Release 2/2.01, you can retrieve worksheet files created in earlier releases of *1-2-3* or in *Symphony* by using *.WK? as the file specification. When you save the file, *1-2-3* Release 2/2.01 warns you that it will save it under the same file name but with a WK1 file extension. Therefore you end up with two copies, one with the original filename extension, which does not contain your latest changes, and one with the WK1 extension, which does contain your latest changes.

SAVING WORKSHEETS

When you create a worksheet, it is temporarily stored in RAM. When you exit from *1-2-3* or turn off your computer, you lose whatever is currently in RAM. To save a copy of a file to a floppy or hard disk, use the File Save command.

When you save a worksheet for the first time, you must assign it a name. After you select /File Save, *1-2-3* prompts you to enter a file name. In addition, *1-2-3* displays a list of the existing files in the current directory. Enter a file name and press Return. *1-2-3* appends the extension .WK1 (in *1-2-3* Release 1A, .WKS), saves the file on the disk, and returns to Ready mode. If you specify a name already in use, *1-2-3* gives you a chance to cancel the File Save operation or replace the existing file with the current worksheet.

If you try to save a file you previously named, *1-2-3* assumes that you want to save it under the existing name and displays *Enter save file name*, followed by the current directory (the current directory doesn't appear in *1-2-3* Release 1A) and the existing file name. To accept that name, press Return. To specify a new file name, press Escape to erase the displayed file name and enter a new one.

EXTRACTING PORTIONS OF WORKSHEETS

Sometimes a file is so cumbersome that you need to chop it into more manageable chunks. Use the File Xtract command to save a portion of a worksheet in a separate worksheet file.

The File Xtract command prompts you to supply the format that the command should use for the extracted data (formulas or values), a file name, and a range. Extracting formulas saves the current worksheet's formulas, labels, numbers, and results of formulas in the new worksheet. Extracting values saves labels, numbers, and only the results of the current worksheet's formulas in the new worksheet. After you select either formulas or values, specify a file name for the new worksheet and indicate the range of cells to be extracted. To indicate a range, you can use Point mode to highlight the area, enter the range address (for example, A1..C2000), or enter a named range. *1-2-3* saves the range you specify under the file name you indicated. The original worksheet file remains unchanged.

When you extract formulas, all cell references, whether relative or absolute, adjust to reflect their new positions in the worksheet. For example, if you extract range D4..F7, the contents of those cells will be in range A1..C4 in the new worksheet. If cell D4 contains the formula +E4, then cell A1 in the new worksheet will contain the formula +B1.

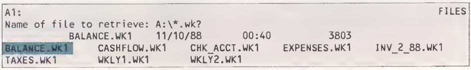
COMBINING WORKSHEETS

The File Combine command lets you combine all or part of an existing file into the current worksheet. After you select /File Combine, you may choose to copy, add, or subtract the incoming values.

The Copy option replaces the contents of cells in the current worksheet with the contents of the corresponding cells in the incoming worksheet. However, a blank cell in the incoming worksheet does not overwrite the corresponding cell in the current worksheet.

The Add option adds the incoming values to the values in the corresponding cells in the current worksheet. An incoming value replaces a blank cell. An incoming cell that is blank or that contains a label or label-returning string formula does not affect the current worksheet.

The Subtract option subtracts the incoming values from the existing values in the current worksheet. As you might



```
A1:                                                                  FILES
Name of file to retrieve: A:\*.wk?
           BALANCE.WK1    11/10/88       00:40          3803
BALANCE.WK1    CASHFLOW.WK1    CHK_ACCT.WK1    EXPENSES.WK1    INV_2_88.WK1
TAXES.WK1      WKLY1.WK1       WKLY2.WK1
```

FIGURE 2. Press the NAME key after selecting /File Retrieve, and you see a display of file names. As you move the pointer to each file in the list, the file name, size, and date and time of creation appear.

expect, a positive incoming value subtracted from a blank cell produces a negative result.

After you select /File Combine and specify copy, add, or subtract, you must indicate whether you want to merge the entire incoming file or just a named range (for example, *budget*) or specified range (for example, A1..B200). If you select the latter, enter a named range or range address. In *1-2-3* Release 1A, you can choose to combine the entire file or a named range.

Next, *1-2-3* prompts you for the name of the incoming file. You can either enter the incoming file name or highlight the file name. The upper-left cell in the incoming file or range is combined into the cell containing the cell pointer. The remainder of the incoming file or range is combined into the corresponding positions below and to the right of this cell. If you accidentally position the pointer so that the combined file operation extends past the right or bottom worksheet boundaries, you get a *Worksheet full* error message.

The File Combine operation can be a little tricky. As a precautionary measure, save the file before you combine another file with it. And remember that while *1-2-3* is executing the File Combine command, the incoming file or range and the current file remain intact on the disk. If you fail to get the results you want, don't save the worksheet. Instead, retrieve the file into which you want to combine the incoming file and start over. For more on the file combine command, see "Getting It All Together with File Combine" (January 1987).

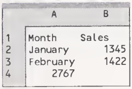
IMPORTING A FILE

The File Import command makes it possible for you to pull data into the current worksheet from an ASCII text file, which most word processors and many other programs, including *1-2-3*, can create. The data appears at the location of the cell pointer.

The File Import command can handle text or numbers. If you select /File Import Numbers, *1-2-3* searches the ASCII file for labels enclosed in quotation marks and for numbers. Each number appears in a cell as a value; each quoted label appears in a cell as a label. Characters in the incoming file that are not quoted are ignored. Look at the adjacent ASCII file named SALES:

```
"Month" "Sales"
"January" 1345
"February" 1422
Total 2767
```

If you're in a blank worksheet with the cell pointer in cell A1, select /File Import Numbers, and specify the file SALES. Here are the results:



```
       A          B

1  Month      Sales
2  January     1345
3  February    1422
4      2767
```

The labels *Month, Sales, January*, and *February* appear in cells A1, B1, A2, and A3, respectively. The value 1345 appears in cell B2, 1422 appears in cell B3, and 2767 appears in cell A4. However, because the word *total* was not enclosed in quotation marks in the original file, *1-2-3* ignored it.

WHAT'S THE PASSWORD?

When a worksheet contains sensitive information, use *1-2-3*'s password protection (not available in *1-2-3* Release 1A) to keep it safe from prying eyes. When you save a worksheet, enter the file name, followed by one space and the letter P. *1-2-3* prompts you to enter a password of up to 15 characters. To confirm your selection, *1-2-3* prompts you to enter the password a second time. If the two entries match, *1-2-3* saves the worksheet with the password.

To retrieve a password-protected worksheet, select /File Retrieve, highlight the name of the file, and press Return. *1-2-3* prompts you to enter the file's password. Be aware that passwords are case-sensitive, so *Salami* will not match *salami*. Keep a written record of your passwords in a safe place because you won't be able to retrieve the file if you forget a worksheet's password.

To remove or change a password, retrieve the file and select /File Save. *1-2-3* displays the file name, followed by [*PASSWORD PROTECTED*]. Press the Backspace or Escape key once to erase [*PASSWORD PROTECTED*]. Then either press Return to save the worksheet without protection, or enter a space followed by the letter P and press Return to assign a new password. *1-2-3* prompts you to enter your new password.

The File Import Text command imports each line in an ASCII file as a single, left-aligned label. This results in a column of long labels.

DIRECTORY, LIST, ERASE

The File Directory, File List, and File Erase commands are utilities that help you manage your *1-2-3* files.

The File Directory command lets you change the default *1-2-3* directory for the current work session. This command is handy. Suppose your global default directory setting is C:\123files. Each time you use a *1-2-3* File command, the program automatically assumes that you want to work with files in the subdirectory *123files*. What if, for one work session, you want to access files on a floppy disk in drive A? Use the File Directory command to change the default directory setting to A:\.

The File List command displays a list of files in the current directory. To list all files, select /File List Other. You may choose to limit the listing to worksheet, graph, or print files. *1-2-3* automatically displays a full-screen list. As you move the pointer through the list, the name, size, and time and date of the file's creation appear.

Finally, when you're sure you no longer need a particular file, use the File Erase command to delete it. You can also use the wild-card characters (? and *) to ease your file deletion chores. ■

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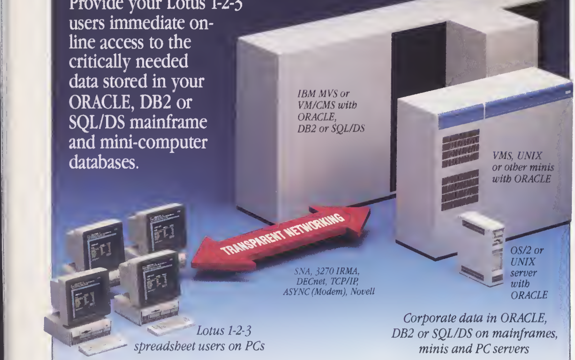

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U.S. SEMINAR SCHEDULE

AK	Anchorage			Feb 6*af*
AL	Birmingham			Mar 8*r*
	Huntsville			Feb 7*g*
	Montgomery			Feb 23
AR	Little Rock			Mar 16
AZ	Phoenix			Feb 7*cfm*
	Scottsdale			Mar 9a
	Tucson			Feb 14
CA	Costa Mesa		Feb 23a*v*	Mar 23*m*
	La Jolla			Feb 9a*m*
	Los Angeles		Feb 16a*cv*	Mar 14*fm*
	Ontario			Mar 21*fm*
	Oxnard			Feb 2*fm*
	Sacramento			Mar 21*f*
	San Diego			Mar 16*cf*
	San Francisco		Feb 15a*pv*	Mar 29*cf*
	Santa Clara		Feb 9a*t*	Mar 9*fv*
CO	Colorado Springs			Feb 22*r*
	Denver			Mar 30*g*
	Englewood			Mar 7a*fp*
CT	Farmington			Mar 7*f*
	Stamford			Mar 21*fm*
DC	Washington		Feb 16*g*	Mar 16*g*
FL	Boca Raton			Feb 7*fm*
	Ft. Lauderdale			Mar 8*t*
	Orlando			Feb 9*g*
	Pensacola			Feb 22
	Tampa			Mar 22*fv*
GA	Atlanta			Mar 23*v*
	Savannah			Feb 16*p*
HI	Honolulu			Mar 14*fp*
IL	Chicago	Feb 22a*	Feb 28*fm*	Mar 21*fv*
	Springfield			Feb 14*c*
IN	Indianapolis		Feb 21a*c*	Mar 22*fm*
KS	Wichita			Feb 16*t*
KY	Lexington			Mar 21*c*
	Louisville			Feb 7*r*
LA	New Orleans			Mar 31a*m*
	Shreveport			Feb 16*r*
MA	Burlington			Mar 15a*f*
	Worcester			Feb 8
MD	Baltimore			Feb 7*t*
	Bethesda			Mar 9*g*a*
	Columbia			Mar 15*p*
ME	Portland			Mar 2*f*
MI	Dearborn			Feb 7*ft*
	Grand Rapids			Mar 8*fm*
	Lansing			Feb 14*fp*
	Troy			Mar 7*fm*
MN	Minneapolis		Feb 15*cr*	Mar 14*fp*
MO	Kansas City			Mar 23a*p*
	St. Louis		Feb 9*t*	Mar 9*fm*
NC	Charlotte			Mar 22*c*
	Greensboro			Feb 15*r*
	RTP			Mar 7*r*
NH	Bedford			Mar 14
NJ	Iselin		Feb 15*fv*	Mar 30*fm*
	Princeton		Feb 15*t*	Mar 15*f*
	Secaucus			Mar 2*f*
NM	Albuquerque			Mar 7*f*
NY	Amherst			Mar 28a*p*
	Fairport			Feb 9*fv*
	Melville		Feb 15*v*	Mar 15*fv*
	New York City		Feb 7a*v*	Feb 22*f*
			Mar 8*v*	Mar 22*f*
OH	Akron			Feb 1*f*
	Beachwood			Mar 7*r*
	Cincinnati			Mar 23*fv*
	Columbus			Mar 9*f*
OK	Oklahoma City			Feb 8*fm*
	Tulsa			Mar 15*t*
OR	Portland			Mar 14*fm*
PA	Harrisburg			Feb 9
	King of Prussia			Mar 31*r*
	Philadelphia			Feb 6*fv*
	Pittsburgh			Mar 15*fv*
	Scranton			Feb 15*p*
RI	Providence			Feb 2*f*
SC	Charleston			Mar 9*fr*
	Columbia			Mar 23*m*
	Greenville			Feb 8*f*
TN	Knoxville			Feb 8*r*
	Memphis			Feb 16*c*
	Nashville			Mar 15*r*
TX	Austin			Mar 2*r*
	Dallas		Feb 1*fv*	Mar 7*cf*
	Houston		Feb 9*fv*	Mar 9a*fp*
	San Antonio		Mar 3*t*	Mar 28*g*
UT	Salt Lake City		Feb 1*f*	Mar 16*m*
VA	Richmond			Feb 22*c*
	Roanoke			Feb 2
WA	Seattle		Feb 21*fv*	Mar 29a*v*
WI	Madison			Feb 22*f*
	Milwaukee			Mar 8*f*

The following key indicates additional afternoon seminars that are offered with these seminar dates

a	Integrating MacIntosh into Corporate Network
c	CASE Tools
f	Oracle Financials
m	Computer Integrated Manufacturing (CIM)
p	PC Workgroup Solutions
r	SQL•Reportwriter
t	ORACLE Transaction Processing Subsystem
v	Value Added Relicensors (VARs)

Please note

g	These seminars are directed to the Federal Government only
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LOTUS MAGAZINE

EFFECTIVE APPLICATION DESIGN

Keep users productive and save your company some money by adopting these design principles.

BY LARRY ROSHFELD

Each PC user costs a corporation roughly $18,000 per year, according to a study by Nolan, Norton & Co. The single largest part of that cost is support and training. Surprisingly, software and hardware are a minimal part of the total. Reduce the amount of time and support someone needs to get results with an application, and you'll save your company money.

This article explores theories for designing easy-to-use, yet effective, microcomputer applications. You won't learn how to lay out a model or write and document a macro, but you will learn how an application should look, feel, and work in order for it to succeed.

Before building a *1-2-3* or *Symphony* application, answer these questions: Is this task worth doing in *1-2-3* or *Symphony*? What should the application do? How is the task being done today?

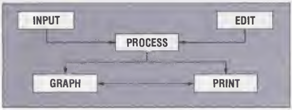
These questions force you to address certain critical issues up front. If you're uncertain about the answers, the application-development process may be chaotic.

Once you've answered these questions and determined that a custom application is justified, you need a set of design principles. In the article "Friendly Mainframe Software Guides Users Toward Productivity" (*Computerworld*, February 3, 1986), Bob Stahl, of The Interface Design Group in Oakland, Calif., devised the acronym TROPIC to describe the principles of good design for mainframe applications. TROPIC stands for transparency, resilience, orientation, productivity, integrity, control.

Larry Roshfeld wrote about using batch files in the October issue.

JOHN HOWARD

These same principles are applicable to the design of *1-2-3* and *Symphony* applications.



Provide users with a sense of place by presenting a Help screen with a diagram of the application's menu structure.

TRANSPARENCY

An application is "transparent" when the software is so easy to work with that it leaves the user free to concentrate on the job at hand.

To design a transparent application, make it resemble a system with which a user is familiar and comfortable. For example, if someone is used to working on a paper form, make the application closely resemble the form.

If you cannot make the application fully transparent, make it intuitive. An intuitive application lets someone anticipate what will happen next. Use familiar *1-2-3* and *Symphony* menu choices and make them operate just as they do in *1-2-3* and *Symphony*. For example, *1-2-3* users are familiar with the Save, Retrieve, Print, and Graph options. When you use the same words and meanings in your custom menu, the user can depend on previous experience and common sense to help in understanding the application.

Finally, make an application behave consistently. For example, if one Save menu selection lets someone enter a new file name or automatically saves the file under the current name, be sure that every Save option in your application operates similarly.

RESILIENCE

An application should anticipate any mistake a person might make and provide for a graceful escape. The key to anticipating mistakes is to build error-checking into the application. For example, a tax application may ask someone to enter the amount withheld for Social Security. By law this amount should be between 0 and $3,379 if the person is not self-employed. Once the figure is entered, the application checks to see if it's a value, not a label or a blank cell, and if it's in the acceptable range. If it meets both criteria, the application allows the user to continue. If it doesn't, the application displays a message indicating that the entry is out of the acceptable range or is a label or blank cell. Then the application asks the user to reenter the amount withheld for Social Security. Providing a graceful escape—in this case, the chance to reenter a salary value—is vital to this application's resilience.

ORIENTATION

Users who are not sure where they are going are likely to get lost. At any point in the application, a person should be able to answer the questions Where am I? What can I do from here? How can I get out? and How can I get to other places?

To help answer the question Where am I? build the application so that the label in the indicator box changes when there's a move to a new part of the application. Accomplish this by using the {INDICATE} macro keyword to create a custom indicator in the upper-right corner of the screen. Then the current location is always clear. This is valuable information when it's time to refer to the application's documentation or ask someone a question.

To help with the question What can I do from here? use the {MENUBRANCH} and {MENUCALL} commands to create a custom menu indicating the available options. Keep each menu choice simple and its line of accompanying explanation clear.

To answer the question How can I get out? include in each menu a choice that lets the user back up one menu level, just as the Escape key does in *1-2-3* and *Symphony*. You might also include Quit on each menu so that the user can exit from the application.

Finally, to answer the question How can I get to other places? include the menu choice Help, which calls a flowchart onto the screen, similar to the one shown in the figure. For example, if someone chooses Help while working in the Print section of an application and this flowchart appears, the cursor would be in the Print section of the diagram.

You can also use the Range Input command within a macro to allow the user to move around the flowchart. Then pressing Return would give more information on that section or move the pointer to that section of the application.

PRODUCTIVITY

To increase productivity, tell the user exactly how to enter data. For example, build into the prompt the correct format for entering a date:

Enter your birthdate (e.g., 12/25/60)

Another way to increase productivity is to build the application so that it accepts different data-entry formats. The application translates whatever the user enters into the required format. Suppose an application requires a serial date value. Someone enters a date as 2/25/89. An @DATEVALUE function built into the application would convert that entry into a serial number.

When possible, provide default values so that all the user has to do is press Return. For example, if the application requires entry of a cost-center number and 80% of the time the number will be 999, the prompt might read:

Enter your cost center (press Return to enter 999):

When building a custom menu, arrange menu choices in order of frequency of use. The choices used most often should be to the left, followed by any other selections. Choices that appear on many menus should appear in the same location on each menu. For example, the Quit or

Exit selection might always be the rightmost choice on the menu.

An application should anticipate mistakes a user might make.

Help people avoid dead ends. If someone must enter data before printing or graphing, create a self-modifying macro menu that displays only appropriate choices. For example, before the user enters data, the menu might look like this:

Update (Print) (Graph) Quit

Here the Print and Graph choices are off-limits, as indicated by the parentheses. After the user chooses Update to enter data, the menu might change to make all menu choices valid and look like this:

Update Print Graph Quit

To do this, use an @IF function within the macro. If the user chooses Update, the macro changes the value in a cell named *counter* from 0 to 1. The @IF formula in the cell containing the menu choice Print might read:

@IF(counter=0,"(Print)","Print")

This formula displays the option (Print) if the user has not already used the Update choice to enter data. If the user has already selected Update, the cell named *counter* equals 1 and the menu displays the option Print.

The cell containing the prompt for the Print menu choice might read:

@IF(counter=0,"This option not available.",
"Print Report")

And finally, the first line of the macro under the Print option can contain a formula such as the following:

@IF(counter=0,"{MENUBRANCH menu}","{print}")

If the user chooses (Print), the macro redisplays the menu. However, if the user chooses Print, the macro calls the Print subroutine.

Another technique that increases productivity is to duplicate commonly used menu options with individual macros. Then, for example, to print out a report, a user can work through the custom menu or save time by simply invoking an individual print macro, which might be named *\p*.

INTEGRITY

If an application has integrity, it keeps the user from damaging any work. Damage occurs when you lose data by accidentally deleting or by failing to save a file. It also ensues if you obtain and save incorrect results.

One way to preserve the integrity of data is to use automatic error checking, discussed earlier, to ensure that the user enters logical data. Then if the user begins to enter illogical data—for example, labels instead of numbers—the application gives a warning and the opportunity to start again.

The application should tell the user that it's possible to lose just-added or updated data when you try to exit from an application without having first saved the file. When the user edits existing data or enters new data, a macro could automatically change the value in a cell from 0 to 1. When the user selects Quit, the application checks the contents of that cell. If it contains 1, indicating newly entered or modified data, the file should be saved. Depending on how you write the application, the macro can either automatically save the file or remind the user to save the changes. If the cell contains 0, the application allows the user to exit from the program immediately.

Documentation also helps maintain the application's integrity. For example, include a Help selection on every custom menu. Depending on the menu, selecting Help might present the user with the option to read on-screen documentation or, as mentioned earlier, to view a flowchart. Another useful option allows the user to enter a question mark at any input prompt. A macro determines whether the input is a question mark. If so, it displays a Help screen that provides detail on that section of the application or refers the user to the appropriate page in the printed documentation.

You might be concerned about the amount of memory that comprehensive documentation requires. If so, put the documentation in a separate file or files. Assign each "page" of the documentation an appropriate range name. When the user chooses the Help option, the program displays a blank screen and uses the File Combine Named-Range command to "retrieve" the appropriate documentation. When finished with the documentation, the user can remove it from RAM. While using this technique increases the number of files needed for the application, it decreases the total size of the application in RAM.

CONTROL

The user must feel in control of the application. For example, error messages should be polite and explanatory. If someone puts the wrong disk in drive A, the error message should help the person correct the condition—for example, *The necessary files aren't on the disk in drive A.* The same holds true if someone attempts inappropriate input. In this case, present a prompt such as *Input out of range. Please enter a value between $15 and $100.* Helpful messages like these remind both application developers and users that they are in a partnership. ■

What specific application-design techniques would you like to know more about? Write to Phyllis Sharon, LOTUS *Magazine, P O Box 9123, Cambridge, MA 02139-9123.*

This is abou

At this moment, millions of Lotus® 1-2-3® users are faithfully awaiting the arrival of a product called Release 3. A character-based product that promises greater power and greater productivity for serious spreadsheet users.

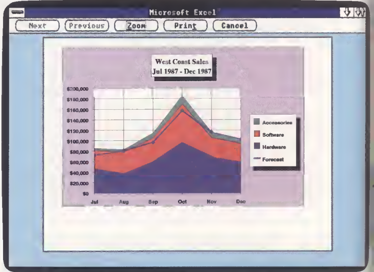
Microsoft Excel. Or, how to see Lotus 1-2-3 Release 3 from a whole new perspective.

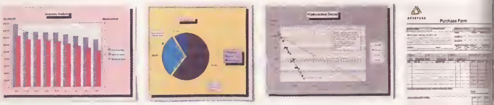
As soon as it gets here.

In the meantime, we have a question: If Release 3 is in fact character-based, and the entire personal computing industry continues moving toward *graphics*-based environments, is it wise to wait for Release 3? Or consider the alternative.

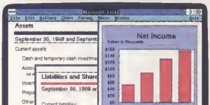
Actually, you can do both. Because you have nothing to lose by seeing the other side of the spreadsheet story, and trying it for yourself.

It's called Microsoft® Excel. The spreadsheet specifically designed for graphic environments—the industry's emerging standard. Five minutes in front of a demo will show you the fastest, easiest, most enjoyable way to crunch your numbers. Thanks to an incredibly intuitive design that exploits innovations like Microsoft Windows, OS/2 Presentation Manager and, of course, the Macintosh.®





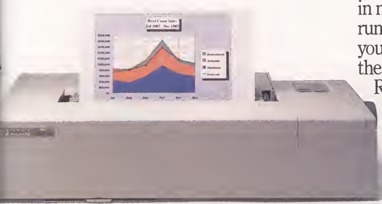
As you know, with 1-2-3 your ability to customize worksheets and charts is limited.
As you may not know, with Microsoft Excel the possibilities are limitless.



Unfortunately, 1-2-3 won't let you move, size, and link an unlimited number of files at the same time. Fortunately, Microsoft Excel will.

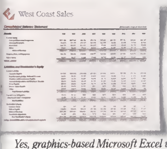
You're a loyal Lotus user. If you're a bit skeptical, we fully understand that. We also anticipated it. So we've made sure your hard-earned equity in 1-2-3 is not obsolete. In fact, we've not only made a transition to Microsoft Excel attractive, we've also made it easy: Microsoft Excel actually reads and writes

t Lotus 1-2-3.



No more wasted trips to the printer. Microsoft Excel comes with Print Preview for true WYSIWYG. Unlike Release 3.

1-2-3 files and even helps translate macros. It also offers the convenience of 1-2-3 on-line help—so you can expect a surprisingly smooth transition. In fact, the slash key you punch to access your 1-2-3 commands is the same key that can access Microsoft Excel commands—you don't have to relearn a thing.



Yes, graphics-based Microsoft Excel was designed around a mouse. You can also use it without one.

Another issue: hardware.

As Lotus may or may not have told you, Release 3 will need a substantial investment in new hardware. The same hardware that runs Microsoft Excel. All we're saying is, if you're committing to new machines, make the most of those new machines. Something Release 3 simply won't.

But, using is believing. So we've made it convenient to get a sample of Microsoft Excel in your hands. Simply call us at (800) 541-1261, Dept. J16 for a free sample disk of your own. It's worth the call. It's worth the experience.

For even more convincing, call for a sample disk. The disk is free. But the experience is priceless.

In fact, we're so confident about Microsoft Excel that we're offering a no-questions-asked, money-back guarantee good through January 1990. Which means we're actually willing to guarantee our current technology against Lotus technology that isn't even available yet.

All of which brings us to a decision millions of you are about to face:

Upgrade to character-based Release 3, or upgrade to the power and simplicity of a graphics-based spreadsheet. We're not saying it's an easy decision.

Just an inevitable one.

Microsoft®
Making it all make sense.™

Money-back guarantee valid only if purchased after May 1, 1988. Customers in Canada, call (416) 673-7638. Outside North America, call (206) 882-8661. © Copyright 1989 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and Making it all make sense is a trademark of Microsoft Corporation. Lotus and 1-2-3 are registered trademarks of Lotus Development Corporation. Macintosh is a registered trademark of Apple Computer, Inc.

T-B
T-BO
T-BOND
T-BOND
G F
2/3
0
2.
5
1.
4
6%
7%
18

BY JON FRYE

Don't Be Daunted
BY T-BOND CALCULATIONS

Whether you invest in bonds, business, or buildings, you know that calculating return is critical to every investment decision. For U.S. Treasury bonds, however, the yield calculation involves a daunting formula. Because of the complex math, many institutional investors shy away from using *1-2-3* or *Symphony* to calculate accurate treasury-bond yields. Instead they use a calculator or settle for a spreadsheet approximation of yield. But for financial institutions and corporate finance departments, the last few basis points (hundredths of a percentage point of yield) can make or break an investment decision. Therefore, accuracy is important.

For a bond investor the template described here can:

- calculate treasury-bond yield accurately to three decimal places
- determine the intra-day yield values useful in making buying decisions
- determine total bond portfolio value at any point in time
- calculate bond portfolio average weighted yield

More than 200 U.S. Treasury bonds with a total valuation of approximately two trillion dollars are currently available for purchase on the open market. Each pays a stated coupon rate in two installments per year until its maturity date. For example, each $100,000-face-value, 7 1/2% coupon treasury bond due to mature in November 2016 pays $3,750 (half the year's coupon rate of $7,500) on May 15 and November 15 each year until November 15, 2016. At maturity the bond pays the final coupon payment plus principal, or a total of $103,750. The price of this bond in the open market varies each day. You make money by buying and selling these bonds in accordance with price fluctuations, in addition to receiving income from coupon payments.

ABOUT THE MODEL

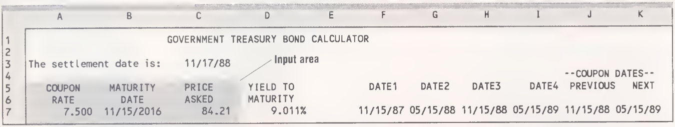
This template can be used in any version of *1-2-3* or *Symphony*. It requires three pieces of information: coupon rate, maturity date, and asking price. In response, it calculates settlement date (the day the transaction will be completed) and yield to maturity. The model relies on formulas using date functions to calculate coupon periods. It also incorporates formulas that depend on the @NOW function (in *1-2-3* Release 1A, @TODAY) to return an accurate date.

Sophisticated mathematics in the template uses a yield estimate to calculate a test price. This test price is then compared with the actual price entered. If the prices do not match, the model knows that the estimate of yield used to calculate the test price was incorrect. It supplies another yield estimate and calculates the test price again. Another comparison between test and actual price is made, and if these prices do not match, still another yield estimate is made. A total of five calculation steps are per-

Here's a template to track the performance of treasury bonds.

Jon Frye has worked as a Fed watcher and futures hedge consultant. He currently researches financial arbitrage for the Continental Bank in Chicago.

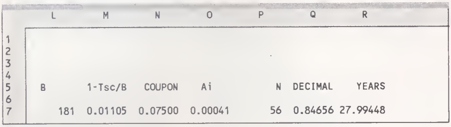
MARC YANKUS



	A	B	C	D	E	F	G	H	I	J	K
1				GOVERNMENT TREASURY BOND CALCULATOR							
2											
3	The settlement date is:		11/17/88								
4										--COUPON DATES--	
5	COUPON	MATURITY	PRICE	YIELD TO		DATE1	DATE2	DATE3	DATE4	PREVIOUS	NEXT
6	RATE	DATE	ASKED	MATURITY							
7	7.500	11/15/2016	84.21	9.011%		11/15/87	05/15/88	11/15/88	05/15/89	11/15/88	05/15/89

Input area

FIGURE 1. The highlighted cells constitute the input area, where you enter the coupon rate, maturity date, and asking price of the bond. Yield is returned in cell D7. Date functions calculating coupon periods in range F7..K7 facilitate the accrued interest calculations to determine yield.



	L	M	N	O	P	Q	R
1							
2							
3							
4							
5	B	1-Tsc/B	COUPON	Ai	N	DECIMAL	YEARS
6							
7	181	0.01105	0.07500	0.00041	56	0.84656	27.99448

FIGURE 2. This area of the yield template performs numerical conversions of coupon rate (cell N7) and bond price (cell Q7). Other cells contain calculations related to coupon-period elapsed and coupon-period remaining.

formed, though most yields are determined in three calculation cycles.

The degree of yield-estimate adjustment is governed by the disparity between test and actual price values. The larger the disparity, the larger the adjustment. The template is designed to use five sets of price calculations to generate five test prices. Test prices are compared to the actual bond price you enter.

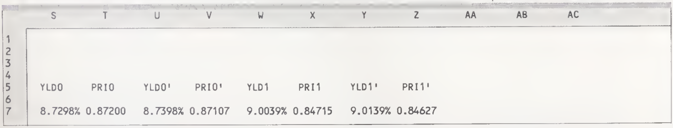
You can make multiple copies of the template we'll be using here to embed in a larger template. All the calculations occur in a single row. You can copy the entire row down the worksheet and analyze or average the yields of several treasury bonds in a portfolio. The box on the facing page provides instructions for building the template.

The template has several functional areas. Range A5..C7 (see figure 1) is the input area. Because of bond-trading conventions, the bond price in cell C7 is entered in percents of a dollar, with any fractional portions expressed in 32nds. Thus, a price of 84.21 means $84 21/32 per $100 face value. The model automatically converts thirty-seconds to decimal equivalents. The yield to maturity is returned in cell D7. A given bond's maturity date is entered in an @DATE function in cell B7. To enter the maturity date for a different bond, you edit the year, month, and day arguments of this function.

Range F7..I7 contains date functions used to calculate the previous and next coupon dates. These dates are important because they affect the value of accrued interest. Cells J7 and K7 return the previous and next coupon dates. In cell L7 (see figure 2), the value 181 appears. This value represents the number of days in the current coupon period. Usually this value represents six months—approximately 180 days. In cell M7, the fraction of the current coupon period thus far elapsed (1−Tsc/B) is calculated. Cell N7 divides the coupon rate in cell A7 by 100 so that it can be used in other calculations.

Accrued interest is calculated in cell O7 (more information on this in a minute). Cell P7 returns the number of coupon payments remaining until the bond's maturity. In cell Q7, bond price is converted from percent and thirty-seconds of a percent to dollars and cents. Cell R7 calculates the number of years remaining until maturity, a value used in calculating the initial yield estimate.

Range S7..V7 is where the iterative calculation routine begins (see figure 3). YLD0 is the initial estimate of yield calculated by the model. PRI0 is the price consistent with that estimate of yield. YLD0′ is the initial yield estimate plus 1 basis point (0.01% of yield). PRI0′ is the price consistent with that yield. The formula in cell W7 returns a



	S	T	U	V	W	X	Y	Z	AA	AB	AC
1											
2											
3											
4											
5	YLD0	PRI0	YLD0'	PRI0'	YLD1	PRI1	YLD1'	PRI1'			
6											
7	8.7298%	0.87200	8.7398%	0.87107	9.0039%	0.84715	9.0139%	0.84627			

FIGURE 3. This section of the worksheet, and additional cells to the right that are not shown, contains iterative calculation routines returning yield values (YLD) and prices associated with those yields (PRI). YLD′ and PRI′ reflect impact on price of a change in yield of one basis point (.01%). The price associated with various yields is compared with the price entered in cell C7. The yield calculated is correct when compared prices match.

refined estimate of yield. The range containing YLD1 entries (W7..Z7) calculates the first improved estimate of yield. The cells containing YLD2 entries (these and the following cells are not shown in the figures) calculate the second improved estimate of yield. The YLD3 and YLD4 cell groups further refine the yield estimate. YLD5 is the fully refined estimate of yield.

CALCULATING ACCRUED INTEREST

The bond buyer pays the bond seller on settlement day, usually the next business day. Cell C3 calculates settlement day, assuming the transaction occurs on the date returned by @NOW. The settlement date is one day later unless @NOW returns a Friday, in which case it's three days later. Since interest accrues each day from the date of the previous coupon payment to the date of the next coupon payment, the model calculates these two dates in range J7..K7.

The previous and next coupon dates can be any of four dates: the two coupon dates in the current coupon year, the last coupon date in the previous coupon year, or the first coupon date in the next coupon year. The model calculates all four dates (F7..I7). It then tests to see which of these dates has a date number closest to but less than the date number of @NOW. This is the previous coupon date. It also tests to see which of the four dates has a date number closest to but larger than @NOW. This is the next coupon date.

Cell F7 contains an @DATE(*year, month, day*) function. *Year* is one less than the year of settlement (based on the date number in cell C3); *month* is the month in which coupon payments are made; *day* is the day of the month on which coupon payments are made. *Date2, Date3*, and *Date4* are calculated once *Date1* is determined. Cell J7 uses a nested @IF statement to determine which among *Date1, Date2*, and *Date3* was the previous

HOW TO SET UP THE WORKSHEET

1. Default settings

Format: Fixed 5

1-2-3: /Worksheet Global Format Fixed enter 5. In *1-2-3* Release 1A: /Worksheet Global Column-Width, enter 10.
Symph: MENU Settings Format Fixed, enter 5

Label-Prefix: Center

1-2-3: /Worksheet Global Label-Prefix Center
Symph: MENU Settings Label-Prefix Center

2. Individual column widths

Columns A to D: 12

To set the width of column A, place the cell pointer in column A, select

1-2-3: /Worksheet Column Set-Width, enter 12.
Symph: MENU-Width Set, enter 12

3. Cell formats

Format	Range
Date 4*	B7, C3, F7..K7
Fixed 0	L7, P7
Fixed 2	C7
Fixed 3	A7
Percent (%) 3	D7
Percent (%) 4	S7, U7, W7

*Date 1 in *1-2-3* Release 1A

For example, to set the format for cell B7, select

1-2-3: /Range Format Date 4, indicate range B7
Symph: MENU Format Date 4, indicate range B7

4. Labels

Enter all labels shown in figures 1, 2, and 3. Then enter the following labels in the cell indicated.

Cell	Label
AA5	YLD2
AB5	PRI2
AC5	YLD2′
AD5	PRI2′
AE5	YLD3
AF5	PRI3
AG5	YLD3′
AH5	PRI3′
AI5	YLD4
AJ5	PRI4
AK5	YLD4′
AL5	PRI4′
AM5	YLD5

5. Range names

Name	Range
SETT	C3

To assign a range name, select

1-2-3: /Range Name Create, enter SETT, indicate range C3.
Symph: MENU Range Name Create, enter SETT, indicate range C3.

6. Enter and copy formulas

1-2-3 Release 1A users must replace @NOW with @TODAY.

Cell	Formulas
B7	@DATE(116,11,15)
C3	@INT(@NOW)+1+@IF(@MOD (@INT(@NOW) −@DATE(88,1,8),7) =0,2,0)
D7	+AM7
F7	@DATE(@YEAR($SETT)−1, @CHOOSE(@MONTH(B7)− 1,7,8,9,10,11,12,7,8, 9,10,11,12),@DAY(B7))
G7	@DATE(@YEAR($SETT), @MONTH(F7)−6,@DAY(B7))
H7	@DATE(@YEAR($SETT), @MONTH(F7),@DAY(B7))
I7	@DATE(@YEAR($SETT) +1,@MONTH(G7), @DAY(B7))
J7	@IF(H7<$SETT,H7,@IF(G7 <$SETT,G7,F7))
K7	@IF(G7>=$SETT,G7,@IF(H7 >=$SETT,H7,I7))
L7	+K7−J7
M7	1−(K7−$SETT)/L7
N7	+A7/100
O7	+N7*M7/2
P7	2*(@YEAR(B7)−@YEAR (K7))+(@MONTH(B7)− @MONTH(K7))/6+1
Q7	@INT(C7)/100+ (C7−@INT(C7))/32
R7	(P7−M7)/2
S7	(N7*R7+1−Q7)/(R7− (1−Q7)*(2*R7+1)/4)
T7	+$N7/S7*(1+S7/2) ^$M7+(1−$N7/S7)*(1+S7/2) ^($M7−$P7)−$O7
U7	+S7+0.0001
V7	+$N7/U7*(1+U7/2)^$M7 +(1−$N7/U7)*(1+U7/2) ^($M7−$P7)−$O7
W7	+S7+(T7−$Q7)/(T7−V7) /10000

Copy range T7..AI7 to cell X7.

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coupon payment. For example, if neither *Date3* nor *Date2* is earlier than the date number in cell C3, the previous coupon date is *Date1*.

CALCULATING YIELD TO MATURITY

The yield of a bond depends on the time remaining until principal is repaid. So the model incorporates more calculations involving time. The number of remaining coupon payments in cell P7 depends on both the difference between the year of maturity and the year of the next coupon and the difference between the month of maturity and the month of the next coupon.

The formula in cell T7, the heart of the model, calculates a bond price consistent with the yield appearing in cell S7 It uses relative, absolute, and mixed addresses, which allow it to be copied to other columns and rows. The range $SETT is an absolute cell address because the date number in cell C3 is addressed absolutely. All other addresses use a mix of absolute and relative notation, so the cells that contain coupon rate, number of coupon payments, and so on, are the same in copies that appear on the same row.

The model determines the impact on price of a .01% change in yield. These calculations are performed in cells U7 and V7. Cell W7 calculates the revised estimate of yield. The adjustment to the previous estimate varies directly with the difference between the calculated price and the quoted price and varies inversely with the impact of a one basis point change in yield.

USING THE TEMPLATE

Once you've built the model, it's easy to use. To verify that it works correctly, enter a coupon rate in cell A7, a maturity date in cell B7, and an asking price in cell C7. If you enter a date for the years 2000–2099, add 100 to the year number of the @DATE function. Use bond data from *The Wall Street Journal* or another reliable source.

The yield returned by the template should match the yield value supplied in the *Journal*. If it does not, check to be sure that all formulas are entered correctly. If the formulas are correct and the results still don't match, be sure that the maturity day of the month you are using is correct. Some bonds mature on days other than the 15th of the month. For these bonds, you must edit the formula in cell B7 to return the correct day of maturity.

One final note: Because of the way the date calculations for coupon dates are made, some maturity dates entered in cell B7 cause date formulas to return ERR. The problem occurs when maturity dates fall at the end of months that are six months prior to months with fewer than 31 days. This template cannot be used for bonds with the following maturity dates: March 31, May 31, August 31, October 31, and December 31.

If you are able to devise a solution to this date problem, please write to *LOTUS* and share your technique with other readers. All of us in the bond-trading business will appreciate it. ■

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Q&A

ANSWERS TO YOUR QUESTIONS ABOUT LOTUS PRODUCTS

1-2-3

FROM FIXED-LENGTH ASCII TO 1-2-3 DATABASE

Q. We access a database that is in ASCII fixed-length format. That is, each field is set to a specified width, and blank spaces separate each record's fields. How can I import these files into *1-2-3* so that the fields fall into specified formatted columns?

Jeffrey L. McDowell
Stanford Real Estate Investments
College Station, Tex.

A. In *1-2-3* Releases 2 and 2.01, use the File Import command to bring the file into the worksheet. Then use the Data Parse command to separate the data into your specified columns. When you import an ASCII file with fixed-length format, *1-2-3* stores the data in each row as a label entry in column A. Assume that you've imported the database shown in the first screen below.

Now you need to get *1-2-3* to store the data so that each item appears in its own cell under the appropriate field names. To accomplish this, set appropriate column widths and complete the following steps. To determine column widths, identify the longest entry in each field, and use that number of characters as the column width. In this example, in the *Description* field, *Font Cartridge* is the longest entry.

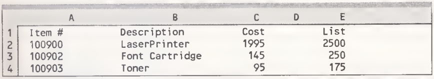
1. Place the cell pointer in cell A2 and select /Data Parse Format-Line Create. *1-2-3* gives you its best guess of how your data should be divided. In this example, you want the *Item #* entries to be parsed as labels. Select Format-Line Edit and replace the format line's leftmost V with an L to match the format line in row 2 shown in the second screen below.

2. Select Input-Column from the Data Parse menu and specify a range that contains the format line and all the data you want to parse (in this example, range A2..A5).

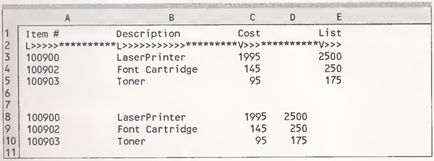
3. Now select Output-Range and specify cell A8 as the top-left cell of the range to receive the parsed data.

4. Select Go, and *1-2-3* will separate the labels in the Input range into the specified columns in the Output range, as shown in range A8..D10.

5. When you're satisfied that *1-2-3* has parsed all the data correctly, you can erase the Input range and the format line. If you're still not happy with the parsing job, you may edit the format line further, until it produces the correct arrangement of data. When the data is parsed correctly, enter appropriate field names at the top of each database column.



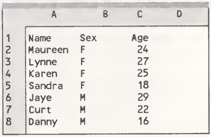
```
            A                 B                  C      D        E
1  Item #           Description          Cost          List
2  100900           LaserPrinter         1995          2500
3  100902           Font Cartridge        145           250
4  100903           Toner                  95           175
```



```
            A                 B                  C      D        E
1  Item #           Description          Cost          List
2  L>>>>>**********L>>>>>>>>>>>*********V>>>**********V>>>
3  100900           LaserPrinter         1995          2500
4  100902           Font Cartridge        145           250
5  100903           Toner                  95           175
6
7
8  100900           LaserPrinter          1995   2500
9  100902           Font Cartridge         145    250
10 100903           Toner                   95    175
11
```

DATA QUERY EXTRACT

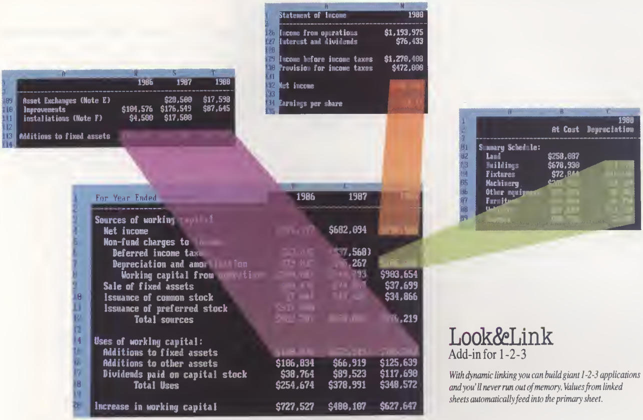
Q. I used *1-2-3*'s Data Sort command to sort the database shown in the following figure. For reporting purposes, I want to separate the records of the males from those of the females. I tried writing a macro that compares the field entry for sex with that of the next record and inserts some blank rows when it finds a change in column B from F to M. Is there an easier method?



```
        A          B        C         D
1  Name       Sex       Age
2  Maureen    F          24
3  Lynne      F          27
4  Karen      F          25
5  Sandra     F          18
6  Jaye       M          29
7  Curt       M          22
8  Danny      M          16
```

W. H. Cox
St. Simons Island, Ga

A. The easiest way to separate sections of a database is to use the Data Query Extract command. Using your example, copy range A1..C1 to cells A11 and A15. Enter *M* in cell B12 as the criterion for selecting all records with an M in the *Sex* field. Select /Data Query Input and specify A1..C8. Select Criterion and specify A11..C12. Select Output and specify A15..C15. To extract all records of males to the Output range, select Extract. To extract all records of females, copy range A1..C1 to an area next to,



```
                                  1986      1987      1988
109 Asset Exchanges (Note E)             $20,500   $17,590
110 Improvements              $104,576  $176,549   $87,645
111 installations (Note F)      $4,500   $17,500
112
113 Additions to fixed assets
114
```

```
    Statement of Income                            1988

126 Income from operations                   $1,193,975
127 Interest and dividends                      $76,433
128
129 Income before income taxes               $1,270,408
130 Provision for income taxes                 $472,000
131
132 Net income
133
134 Earnings per share
135
```

```
                                         1988
                              At Cost  Depreciation
  1
  2
  3
 01 Summary Schedule:
 02   Land                   $258,087
 03   Buildings              $678,938
 04   Fixtures                $72,8
 05   Machinery
 06   Other equi
 07   Furnit
 08
 09
```

```
 1  For Year Ended                          1986      1987
 2
 3  Sources of working
 4    Net income                                  $682,094
 5    Non-fund charges to
 6      Deferred income tax                      (  7,560)
 7      Depreciation and amor                        ,267
 8        Working capital from                            $903,654
 9    Sale of fixed assets                                 $37,699
10    Issuance of common stock                             $34,866
11    Issuance of preferred stock
12          Total sources                                     ,219
13
14  Uses of working capital:
15    Additions to fixed assets
16    Additions to other assets         $106,834   $66,919  $125,639
17    Dividends paid on capital stock    $38,764   $89,523  $117,690
18          Total Uses                  $254,674  $378,991  $348,572
19
20  Increase in working capital         $727,527  $480,107  $627,647
```

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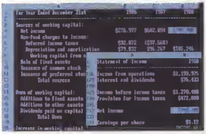

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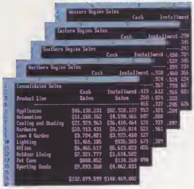

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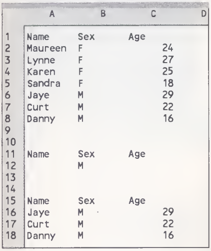
but not below, the Output range you created previously (row 15). Enter F in cell B12. Redefine the Output range as this new set of field headers and select Extract.



```
       A          B          C          D
 1  Name       Sex        Age
 2  Maureen    F                   24
 3  Lynne      F                   27
 4  Karen      F                   25
 5  Sandra     F                   18
 6  Jaye       M                   29
 7  Curt       M                   22
 8  Danny      M                   16
 9
10
11  Name       Sex        Age
12             M
13
14
15  Name       Sex        Age
16  Jaye       M                   29
17  Curt       M                   22
18  Danny      M                   16
```

1-2-3/SYMPHONY

HOW TO CUBE VALUES

Q. Using *1-2-3*, how can I calculate the following formula, which involves cubing a value?

$$\frac{1}{(1+.14)^3}$$

Viraj Wikamanayake
Bahamas Limited Bank and Trust
Nassau, Bahamas

A. The formula is 1/(1+.14)^3.

In both *1-2-3* and *Symphony*, use the caret (^) to raise a number to a power. Use the slash (/) for division and the asterisk (*) for multiplication.

USING RANGE NAMES IN CRITERION FORMULAS

Q. I tried to use the following formula in my Criterion range to extract records from my database:

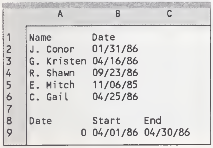
+date>start#AND#date<end

Date is a field in my database and *start* and *end* are named ranges into which I enter the dates that bound those I want to extract. When I select Extract from the menu, no records appear in the Output range even though many records match the criteria. Why is it that the formulas +date>start and +date<end work separately but don't work when I combine them?

Kathy Eybs
Electronic Data Systems
Sandusky, Ohio

A. Your original formula will work if you make the references to *start* and *end* absolute. In the database that follows, the dates in column B and in the ranges *start* and *end* (cells B9 and C9) consist of @DATE formulas. The following criterion formula in cell A9 selects records in which the date is greater than 4/1/86 and less than 4/30/86:

+B2>$start#AND#B2<$end



```
        A            B          C
1  Name         Date
2  J. Conor     01/31/86
3  G. Kristen   04/16/86
4  R. Shawn     09/23/86
5  E. Mitch     11/06/85
6  C. Gail      04/25/86
7
8  Date         Start      End
9             0 04/01/86  04/30/86
```

USING @SUM TO SUM A BLOCK OF DATA

Q. Every month we receive orders from each of our 47 sales offices. My job is to total all of the orders. Each office location has its own column in my worksheet. What would be the best way to calculate the total orders received so far this year?

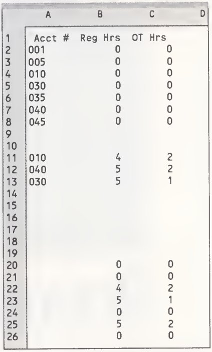
Shawn Lanchantin
Dunn Industries
Clearings, N.Y.

A. If the 47 location names are in range A1..AU1 and you make an entry for each location every month, the data will occupy range A2..AU13 at the end of 12 months. The simplest way to calculate the total orders received for all locations this year is to use the formula @SUM(A2..AU13).

@VLOOKUP AND COMBINE

Q. I download weekly data into *1-2-3* from our corporate mainframe computer. The incoming data has three fields of information: account number, regular hours, and overtime hours. The weekly data includes only the account numbers that were used that week. I need to generate monthly summary reports that cover all accounts, regardless of when they were used. How can I incorporate the weekly data into the monthly summary report?

Here is the layout of the weekly data, range A11..C13, and the monthly report range, A1..C8:



```
        A          B          C          D
 1   Acct #   Reg Hrs   OT Hrs
 2  001             0          0
 3  005             0          0
 4  010             0          0
 5  030             0          0
 6  035             0          0
 7  040             0          0
 8  045             0          0
 9
10
11  010             4          2
12  040             5          2
13  030             5          1
14
15
16
17
18
19
20                  0          0
21                  0          0
22                  4          2
23                  5          1
24                  0          0
25                  5          2
26                  0          0
```

Alex Tang
Gannett Outdoor Co of Southern California
Los Angeles, Calif

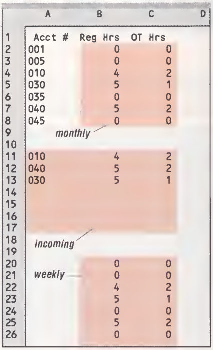
A. You can accomplish what you want by using this procedure. Prepare the worksheet by assigning the name *incoming* to the range that will contain the incoming weekly data (range A11..C17 for this discussion). The range must be large enough to accommodate all account numbers, in the event all of them are used during a week. Next, assign the name *weekly* to range B20..C26 and the name *monthly* to range B2..C8. Enter the following formulas into cells B20 and C20, respectively:

```
@IF(@ISERR(@VLOOKUP
  (A2,$incoming,1)),0,
  @VLOOKUP(A2,$incoming,1))

@IF(@ISERR(@VLOOKUP
  (A2,$incoming,2)),0,
  @VLOOKUP(A2,$incoming,2))
```

Then copy range B20..C20 to range B21..B26.

Each week, combine the weekly data from the mainframe into the range named *incoming*. The formulas in *weekly* will be updated to show the week's account numbers and hours. The formulas will return 0 for regular and overtime hours if an account number wasn't used. Save the file and position the cell pointer on cell B2. Select /File Combine Add Named/Specified-Range (in *Symphony*, SERVICES File Combine Add Named-Area), specify *weekly* as the range to combine (in *Symphony*, Ignore Values), and specify the file's name as the file to combine. The range *monthly* will be updated with the data from *weekly*. Save the file and repeat the procedure when next week's data is available. After the first week, your spreadsheet will look like the following one:



```
        A        B        C        D
1    Acct #  Reg Hrs   OT Hrs
2    001           0        0
3    005           0        0
4    010           4        2
5    030           5        1
6    035           0        0
7    040           5        2
8    045           0        0
9          monthly
10
11   010           4        2
12   040           5        2
13   030           5        1
14
15
16
17
18   incoming
19
20                 0        0
21   weekly        0        0
22                 4        2
23                 5        1
24                 0        0
25                 5        2
26                 0        0
```

SETTING COLUMN WIDTHS

Q. I recently started using *1-2-3*, and I have a question regarding setting column widths. Is it possible to set a column width of 10 to range A1..A20, a width of 15 to range A21..A40, and a width of 20 to range A41..A60? When I attempt to do this, the entire column ends up with a width of 20.

Hugh J. Clausen
Secretary of the Board of Trustees
Clemson University
Clemson, S C

A. Selecting /Worksheet Column Set-Width (in *Symphony*, MENU Width Set) affects the entire column, so it isn't pos-

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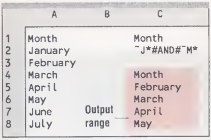
sible for ranges within the same column to have different widths. You must determine the largest width necessary and use that number for the column width. *1-2-3* users can split the worksheet into two windows (/Worksheet Window Horizontal or /Worksheet Window Vertical) and display different column widths in each. *Symphony* users can display different column widths in each window they create.

MULTIPLE LABEL CRITERIA

Q. Using the following database, I want to extract all records except those that begin with J or M. My criterion formula, ~J*#AND#~M*, uses the asterisk to match any number of characters and the tilde to extract all records except the one specified. When I enter the formula and use the Data Query Extract command, the only records excluded are those that begin with J. What's wrong?



```
          A            B            C

1   Month                       Month
2   January                     ~J*#AND#~M*
3   February
4   March                       Month
5   April                       February
6   May                         March
7   June        Output          April
8   July        range   ——      May
```

Ed Mitchell
New Haven, Conn

A. You can use an asterisk only as the last character in a criterion formula. Your formula excludes only records that begin with J, as shown in the Output range, because *1-2-3* and *Symphony* ignore any characters that follow an asterisk.

Enter the following criterion formula in cell C2 to extract all records except those that begin with J or M:

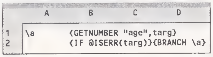
@LEFT(A2,1)<>"J"#AND#@LEFT
(A2,1)<>"M"

This formula works in *1-2-3* Release 2/2.01 and all releases of *Symphony*.

Q&A REVISITED

{GETNUMBER} CONFUSION

Q. I've come up with a simple solution to the problem experienced by Kevin Besecker [September]. You can avoid getting ERR in the target cell when you enter a label in response to a {GETNUMBER} command by adding a line to the macro. For example:



```
          A          B          C          D

1   \a         {GETNUMBER "age",targ}
2              {IF @ISERR(targ)}{BRANCH \a}
```

The {IF} statement in cell B2 determines whether the cell you named *targ* contains ERR. If it does, the macro reuses the {GETNUMBER} command and prompts again for an entry. This works in *1-2-3* Release 2/2.01 and *Symphony*.

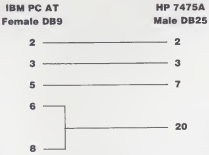
F Eugene Halaburt
Silverton, Colo

CABLE CONFIGURATION

Q. Your response to Maria Solarez [October] included the cable configuration for an IBM PC XT and HP 7475A plotter. You didn't mention that an IBM PC AT requires a different cable configuration.

Ross J Burns
Orlando, Fla

A. Thanks for pointing it out. The following cable configuration connects a 9-pin serial port on the IBM PC AT to a 25-pin serial port on the HP plotter:



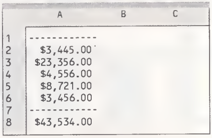
TRUNCATED NUMBER IN HEADERS AND FOOTERS

Q. In reference to James Michal's question [October], I found a way to print right-aligned page numbers greater than 99 in headers and footers. Add a space at the end of the header or footer entry by pressing the Spacebar. For example, if the header is *Sales* | *ABC Co.* | #, type it as shown, press the Spacebar, then press Return. You can now print headers and footers with page numbers up to 999. Add the appropriate number of spaces after the pound sign to print page numbers of four digits or more.

Ira N Childress
Librascope Corp
Glendale, Calif

@SUM WITH VARIABLE START/END CELLS

Q. Your solution to Fred Cheney's problem in the July issue is more elegant than the following, but mine works just as well. Mr. Cheney uses @SUM formulas where the beginning and ending cells of the range to be summed are variable. I solve this problem by placing dashed lines at the top and bottom of the range to be added. My worksheet resembles this:



```
          A            B            C

1   ------------
2     $3,445.00
3    $23,356.00
4     $4,556.00
5     $8,721.00
6     $3,456.00
7   ------------
8    $43,534.00
```

The @SUM formula in cell A8 will automatically adjust as you insert or delete rows between the dashed lines.

Phil Schwartzberg
Kvutzat Urim
Doar Na, Ha neger, Israel

A. Be aware that if you move the cells containing the dashed lines or if you select /Worksheet Delete Row (in *Symphony*, MENU Delete Rows) to delete the rows containing the dashed lines, the formulas may return unexpected results.

CASE INSENSITIVITY IN 1-2-3 RELEASE 2.01 AND INSTALL

Q. In June you provided a solution to S. J. Melling's problem with *1-2-3* Release 2.01's insensitivity to uppercase and lowercase when sorting a database. There is a more basic solution.

You can install *1-2-3* Release 2/2.01 to be case-sensitive or case-insensitive. Select Install from the Lotus Access menu, or enter *install* at the DOS prompt with the *1-2-3* directory current. Follow on-screen instructions until the Install program presents a menu, then select Advanced Options, Modify Current Driver Set, Collating. The Install program offers three options: ASCII, Numbers first, and Numbers last. Select ASCII to make the database functions case-sensitive. ASCII is identical to Numbers first, except that uppercase letters come before lowercase letters. Save the driver set with a unique name such as ASCII.SET. When you want *1-2-3* to use this driver set, start up by entering *lotus ascii* (or *123 ascii* if you want to bypass the Lotus Access menu) at the DOS prompt.

Graham A Patchett
Greenwich, Conn

A. Here are the results of a sort operation in ascending order, depending on which collating driver you choose:

Numbers first
22 Eastern Ave.
23 Rogers Rd.
40 Langdon St.
One broadway place
One Babbitt St.
Park Place
Thirteen Avalon Way

Numbers last
One broadway place
One Babbitt St.
Park Place
Thirteen Avalon Way
22 Eastern Ave.
23 Rogers Rd.
40 Langdon St.

ASCII
22 Eastern Ave.
23 Rogers Rd.
40 Langdon St.
One Babbitt St.
One broadway place
Park Place
Thirteen Avalon Way

RANGE NAME VS. SINGLE-CELL ADDRESS

Q. There seems to be a conflict between two responses in the February 1988 issue. In "@Functions Need Range Argument," you say that *1-2-3* accepts a single-cell address or a range reference as the argument for the @CELL function, but *Symphony* accepts only a range reference. In "Searching for Empty Cells," the @CELL formula you give for both *1-2-3* and *Symphony* is @CELL("type",B2) = "b". Which is correct?

Lowell E Shearer
Alexandria, Va

A. Actually, the @CELL function always requires a range reference. *1-2-3* converts a single-cell reference to a range reference automatically. *Symphony* Release 2.0 also makes the conversion. *Symphony* Releases 1, 1.01, 1.1, and 1.2 require you to enter the argument as a range reference. @CELL is not available in *1-2-3* Release 1A.

EXPANDED HEADERS WITH EPSON PRINTERS

Q. In the August issue you discussed setup strings in response to Valerie Rosen's question about different print styles. Can I use setup strings to print worksheets in the fonts available in PrintGraph?

Joe R. Ashenfelter
Los Angeles, Calif

A. The PrintGraph fonts are graphic elements that print only through PrintGraph. The fonts that setup strings can produce depend on your printer's capabilities. Check your printer manual for available print styles and setup strings.

SUPPRESSING ZEROS IN EMPTY DATABASE FIELDS

Q. I have another answer to Michael Knight's question about how to suppress zeros that result from empty cells in a *Symphony* spreadsheet [April]. He wanted cell T34 to display the contents of cell A17. With the formula +A17 in cell T34, cell T34 displays the label when cell A17 contains a label. When cell A17 is blank, cell T34 displays a zero. If you enter @N(A17..A17) in cell T34, the cell will display the contents of cell A17 when A17 contains a label, and it will appear blank when cell A17 is empty.

Ralph J Brasure III
Liberty University
Lynchburg, Va

A. The @N function returns zero when the cell it refers to is empty. It also returns zero when it refers to a cell that contains a label or a string formula. When the @N function refers to a number or a numeric formula, it returns the value of the number or formula.

The @S function returns a null string (blank) when the cell it refers to is empty. Enter @S(A17..A17) in cell T34. This returns the contents of cell A17 when cell A17 contains a label or string formula. It returns a null string when cell A17 is empty or when cell A17 contains a number or numeric formula.

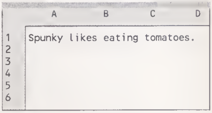
In *Symphony* Release 2.0, you don't need a formula. Within the worksheet, select MENU Settings Zero Yes, then select Quit. *Symphony* will not display zero values during the remainder of your current session with the worksheet.

CONTEST

NEW CONTEST

This month we ask users of *1-2-3* to submit the most effective technique for dividing a sentence entered as a long label into each of its individual words. Your method should place each word of the sentence into its own cell. Don't worry about where the sentence's punctuation marks fall.

For example, if you use the sentence *Spunky likes eating tomatoes* from the following figure, your technique should place the word *likes* in cell A2, *eating* in cell A3, and *tomatoes* in cell A4.



```
        A         B         C         D

1  Spunky likes eating tomatoes.
2
3
4
5
6
```

The first 25 people who submit entries that the *LOTUS* judges consider the best answer will receive a Lotus flight bag. All entries must be postmarked before midnight, February 28, 1989. Winners will be announced in the May 1989 issue. Send your answers to **February Contest**, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123.

Submit contest ideas to Q&A Contest Idea, *LOTUS* Magazine, P.O. Box 9123, Cambridge, MA 02139-9123. Include your solution, documented with appropriate comments. We'll pay $200 if we use your contest idea accompanied by a proven solution, $25 is we use your idea unaccompanied by a solution. ■

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GOOD IDEAS

READER TIPS ON USING LOTUS PRODUCTS

1-2-3

EFFECT OF COLLATING SEQUENCE CHOICES

I'd like to share the following discovery I made when I recently ran the *1-2-3* Release 2/2.01 Install program to add some new printer drivers. I chose Advanced Options from the main menu, then chose Modify Current Driver Set. I inadvertently changed the collating sequence from Numbers First to ASCII.

While working in a spreadsheet in which I use the Data Query Extract command, I noticed that the extraction was now case-sensitive. For example, to extract all items that begin with the letter M, I entered the criterion as *m**, but this caused *1-2-3* to extract only items that begin with lowercase letters. I had to rerun Install and change the collating sequence to Numbers First.

This was only a minor inconvenience for me, but the effect of making this choice may cause the Data Query Extract command to behave in an unexpected way.

Alfred J Touchet Jr
St Martinville, La

USING THE GRAPH KEY AS A SCREEN SAVER

There are a number of software utilities that blank the display if the keyboard is idle for a specified number of minutes. This helps to prevent the image of the *1-2-3* border from "burning in" to the display's phosphorus. *1-2-3*'s GRAPH key can serve the same purpose. When I wish to leave my computer but not exit from *1-2-3*, I press the GRAPH key and my screen goes blank. When I return, I strike any key, and my *1-2-3* worksheet reappears.

If I've just created a graph, I save the current graph settings by selecting /Graph Name Create, then I select Reset Graph Quit to clear the current graph settings. This preserves the new graph and lets me press the GRAPH key to clear the display.

Ron J Low
Sara Lee Bakery Co
Deerfield, Ill

This technique works in all releases of 1-2-3. *It doesn't work in* Symphony.

HIDING AND REDISPLAYING COLUMNS IN 1-2-3

Recently I was working with a large *1-2-3* Release 2 worksheet and wanted to redisplay some columns I had previously hidden with the Column Hide command. In error, I selected /Worksheet Global Format Hidden and expected to find a choice for Hide or Display. To my surprise, the entire worksheet became hidden. I knew the cell contents were still there because they were displayed in the top panel.

I went back through the command choices, but I could not find any command to undo the Hidden format. I checked the *1-2-3 Reference Manual* and found information on page 65 about the Reset menu item on the Range Format menu. However, this doesn't effect global cell formats.

Finally, I called Lotus Product Support and was told that the worksheet's default display format is General. So if you ever wish to redisplay a worksheet formatted with the Hidden format, reset your worksheet's global cell format and select /Worksheet Global Format General.

Richard W Pomeroy
Pomeroy Associates
Hingham, Ma

To redisplay columns that you hid using the Column Hide command, select /Worksheet Column Display and specify the columns you want to redisplay.

CAVEAT WHEN USING RANGE PROTECT

Users of *1-2-3* should be aware that merely using the Range Protect command doesn't actually provide protection. You need to use this command in conjunction with the Worksheet Global Protection Enable command. That is, you first enable global protection, then you use either Range Unprotect to allow data entry or Range Protect to prevent data entry.

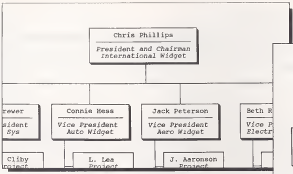
Jay K McBee
The Empire District Electric Co
Joplin, Mo

ADVANCED USES OF SYSTEM COMMAND

When I started using *1-2-3*, I didn't find the System command very useful. Now I use it in several ways. Sometimes I use DOS to copy files to floppy disks because it's faster than using *1-2-3*. I use the Print File command to create an ASCII file, then I use the System command to go to DOS. I load my word processor, use a spelling checker on the text, and merge it with another document. When I exit from the word processor, I type *exit* in DOS to return to *1-2-3* and continue where I left off.

I also use the System command to temporarily exit from *1-2-3* and run PrintGraph. If I don't like a printed graph, I quit PrintGraph, type *exit* at the DOS prompt to return to *1-2-3*, and make the necessary changes. Using the System command is much more efficient than exiting from *1-2-3* and then reloading it.

There are a few caveats, however.



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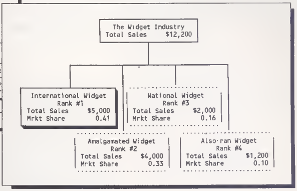

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CIRCLE 118 ON READER SERVICE CARD

Make sure you don't load *1-2-3* twice. When you're in DOS, remember to type *exit* to return to *1-2-3*. If you type *123* or *lotus*, you'll load *1-2-3* into memory a second time. This may use up most of your machine's RAM and leave little for your spreadsheet. Also, make sure you have enough memory to hold both *1-2-3* and whatever program you plan to run. Finally, be aware that some programs dump *1-2-3* from RAM when you run them after using the System command to start DOS.

Jeff Junkermeter
Shorewood, Minn

It's a good idea to save your current worksheet before you select /System. The System command is not available in 1-2-3 *Release 1A.*

1-2-3/SYMPHONY

PERFORM dBASE III MATH FUNCTIONS IN 1-2-3

The following technique is useful when I work with *dBase III* files. After I've entered all the data in the *dBase III* database, I translate it to the *1-2-3* Release 2/2.01 file format so that I can use it in *1-2-3* to do further mathematical analysis. *1-2-3* processes most of the math functions faster than *dBase III*. When I've completed the calculations in *1-2-3*, I use the *1-2-3* Translate utility to convert the file back into *dBase III* format so that I can continue with data processing and reporting functions.

P. Betty Wei
Weston, Mass

This technique also works in Symphony *Releases 1.2 and 2.0.*

WARNING WHEN COPYING LONG FORMULAS

I recently discovered a trap when using *1-2-3* Release 2.01. I entered a long formula (225 characters) in cell BD10 and copied the formula down 150 rows. *1-2-3* performed the Copy command and did not display an error message. But to my dismay, the calculations in the cells below row 99 were incorrect.

The formulas below row 99 gained one character for each cell reference they contained. The added characters caused the formulas to exceed the maximum number of characters allowed per cell (240). *1-2-3* simply truncated the extra characters without warning, thereby invalidating the copied formula!

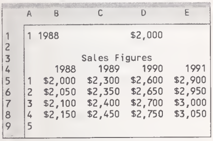
Chuck Abourezk
First National Bank of Louisville
Richmond, Va

Our testing reveals that this bug also exists in Symphony.

LOOKUP BASED ON TWO INDEPENDENT VARIABLES

I needed to look up information in a table based on input of two independent variables. A formula lets me do this.

Assume you have a table like the one below. The years across the top (row 4) are labels, and the quarters are numbered down the side. The sales amounts in the table correspond to the year and quarter in the table's borders. The number 5 in cell A9 causes the formula to return ERR if you ask for information from beyond the fourth quarter.



	A	B	C	D	E
1	1	1988		$2,000	
2					
3			Sales Figures		
4		1988	1989	1990	1991
5	1	$2,000	$2,300	$2,600	$2,900
6	2	$2,050	$2,350	$2,650	$2,950
7	3	$2,100	$2,400	$2,700	$3,000
8	4	$2,150	$2,450	$2,750	$3,050
9	5				

Enter a value from 1 to 4 in cell A1 to represent the quarter whose value you wish to see. Enter a label in cell B1 to represent a year from 1988 to 1991. Then enter the following formula in cell D1:

```
@INDEX(A4..E8,@HLOOKUP(B1,
   A4..E9,0),@VLOOKUP(A1,A4..E9,0))
```

This formula returns the sales figure from the table that corresponds to the quarter and year listed in cells A1 and B1. For example, if you enter *1* in cell A1 and the label *1988* in cell B1, the formula in cell D1 returns $2,000. Any entry outside the year or quarter will yield ERR.

Kevin H Carracher
Cuyahoga Falls, Ohio

1-2-3 *Release 1A doesn't have the @INDEX function.*

TIPS ON CURSOR-MOVEMENT COMMANDS WITHIN MACROS

Macros in *1-2-3* Release 2/2.01 and in all releases of *Symphony* can include arguments in any of the cursor-movement commands (RIGHT, LEFT, UP, DOWN, PGUP, PGDN, BIGLEFT, and BIGRIGHT). The argument can be a number, a cell address, a range name, or a formula.

For example, you can enter {DOWN 6}, {LEFT A1} if A1 contains a value, {RIGHT *number*} if the range named *number* contains a value, or {PGDN @COUNT (A1..B3)}.

In *1-2-3* Release 2/2.01 you can abbreviate the cursor-movement commands as follows:

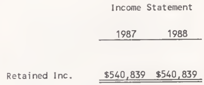
{DOWN}	{D}
{UP}	{U}
{RIGHT}	{R}
{LEFT}	{L}

Both the abbreviated and the full-name commands accept arguments. However, you can't use the abbreviated commands in any release of *Symphony* or in *1-2-3* Release 1A.

Stephen Santos
Newburyport, Mass

PROFESSIONAL UNDERSCORE WITH HP LASERJET

I used to underline a column of numbers by entering underscores or equal signs on a separate row on the spreadsheet, by printing the spreadsheet range to a file and using my word processor to add single or double underscores, or by using a ruler and pen to draw lines manually. I recently learned that my HP LaserJet printer lets me produce underscores on the same printed row as a cell's contents.



```
                          Income Statement

                            1987      1988


Retained Inc.            $540,839  $540,839
```

To do this, insert a row just above the underscore row. Then enter a setup string in the leftmost cell of the Print range as shown in cell A5 of the following figure. Although you see only one split vertical bar (¦) in each setup string, you must precede each setup string with two vertical bars.

To produce a single underscore, enter *\027&a-1R*. To produce a double underscore, follow the steps to produce a single underscore, then insert two rows. On

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INTRODUCING dBASE IV

CIRCLE 119 ON READER SERVICE CARD

"It's a whole lot easier when you can see what you're doing."

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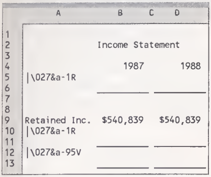


```
              A              B      C     D

 1
 2                       Income Statement
 3
 4                            1987          1988
 5   |\027&a-1R
 6                        __________    __________
 7
 8
 9   Retained Inc.   $540,839       $540,839
10   |\027&a-1R
11                        __________    __________
12   |\027&a-95V
13                        __________    __________
```

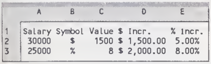
the first new row, enter *\027a-95V* in column A, and enter underscores in the second new row.

J Fred Boone
Washington, D.C.

You must also enter the setup string \027E\027&l0a7.5C\027&k2S at the menu (in 1-2-3 /Printer Printer Options Setup, in Symphony SERVICES Print Settings Init-String).

COMPUTING DOLLAR AMOUNTS AND PERCENTAGES

Our personnel department enters annual increases as percentages and uses a formula to have *1-2-3* find the equivalent dollar amount. However, sometimes the users have determined a dollar amount that they want *1-2-3* to convert to a percentage. I created one formula to compute the dollar amount and another to calculate the amount as a percentage.



```
        A       B       C          D          E

1   Salary Symbol Value $ Incr.       % Incr.
2    30000     $     1500 $ 1,500.00  5.00%
3    25000     %        8 $ 2,000.00  8.00%
```

To reproduce this figure, enter a dollar sign ($) or a percent sign (%) in column B and a corresponding value in column C. The formula in column D gives the dollar amount, and the formula in column E calculates the percentage increase.

Cell **Formula**
D2: @IF(B2="$",C2,@IF(B2="%",A2*C2/100,@ERR))
E2: @IF(B2="%",C2/100,@IF(B2="$",C2/A2,@ERR))

To calculate the dollar-amount increase, the @IF formula in cell D2 determines whether cell B2 contains a dollar sign, and if it does, the formula returns the value in cell C2. If the formula does not contain a dollar sign, it determines whether cell B2 contains a percent sign. If it does, it multiplies the current salary in cell A2 by the value in cell C2 and then divides that amount by 100. This calculates the amount of the dollar increase. If the formula in cell B2 contains neither a dollar sign nor a percent sign, the formula returns ERR in *1-2-3* Release 2 and *Symphony*.

Similarly, to find the percentage increase, the @IF formula in cell E2 determines whether cell B2 has a percent sign. If so, the formula divides the value in cell C2 by 100. If cell B2 has a dollar sign, then the formula divides the dollar increase in cell C2 by the current salary in cell A2. This calculates the percentage increase. If cell B2 has neither a percent sign nor a dollar sign, the formula returns ERR in *1-2-3* Release 2 and *Symphony*.

Ira Friesheim
Cosmair
Piscataway, NJ

If you use 1-2-3 *Release 2.01, substitute the expression @S(B2..B2) for the cell address B2 wherever it occurs in the two formulas.*

SYMPHONY

PAGE BREAKS SETTING CHANGES IN RELEASE 2.0

When I choose SERVICES Print Settings Page Breaks No to suppress the use of headers, footers, and page breaks and then modify the Top or Bottom Margin settings, the Page Breaks setting no longer holds. It changes from No to Yes. To get around this, I change the margin settings before setting Page Breaks to No.

Alicia Cullen
Philadelphia, Pa

DISPLAY PROBLEM WITH COMPUSERVE CCF FILE

When I use the CompuServe CCF file that is included with *Symphony* Release 2.0, it sometimes produces an unintelligible display of characters on the screen. Occasionally, it causes the system to lock up. To correct this problem, go into the COMM window, select Menu Settings, and set the Interface Length to 7 and Interface Parity to Even, or set the Interface Length to 8 and Interface Parity to None.

Peter Dubaine
N Hollywood, Calif

REVISITED

HERCULES DRIVERS/ SYMPHONY FORM

In an October Good Ideas item submitted by Thomas Moorely, you stated that with the Hercules 80 x 25 driver installed, the width of a *Symphony* FORM window could not exceed 77 characters total. I've found that while it is true that you cannot generate a form with more than 77 characters (including the field names, the underscores, and the space that *Symphony* automatically inserts between them), you can edit an existing form so that it is 78 characters wide. After you generate the form, switch to a SHEET window, place the cell pointer in the Entry range on the cell containing the field you wish to lengthen, press the EDIT key, and enter one underscore. In *Symphony* Release 2.0 you can generate a form up to 78 characters across (including the field names, the underscores, and the space that *Symphony* automatically inserts between them). You cannot add underscores to an existing form that has the maximum 78 characters.

Karen F Mackey
Philadelphia, Pa

FLASHING MEM INDICATOR I

Your response to R. C. Mathiessen's idea about eliminating the flashing MEM indicator [September] failed to reveal one possible cause of the problem. After selecting /System to run DOS, some users forget that *1-2-3* is still in RAM. They then restart *1-2-3* by entering *lotus* or *123* instead of *exit* at the DOS prompt. This considerably reduces the amount of memory left for your worksheet, which results in a flashing MEM indicator.

To check whether you have inadvertently loaded *1-2-3* twice, save the worksheet and select /Quit Yes. In DOS enter *exit*. If *1-2-3* is in RAM, you'll return to where you left off earlier. If not, DOS will ignore the EXIT command.

J C Puckett
New York, NY

A funny thing happens when you go around solving other people's database problems.

People tend to think of you as somebody you're not.

But that's all right. Because with all due respect to those who develop applications professionally, the fact is that more and more everyday people are being encouraged to turn out more and more everyday programs.

Of course, it helps if they have a tool like dBASE IV's Applications Generator.

The dBASE IV™ Applications Generator does pretty much what its name implies: it writes the necessary code to pull together all the elements of your application. So you can concentrate more on what you want to accomplish, and less on what you have to do to get there.

The Applications Generator is fully integrated with dBASE IV's new Control Center, too. So you get a simple, understandable way to access all this power. Be careful, though—this combination just might turn you into a programmer.

Which actually may not be so strange after all.

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"It's kind of strange, really—all of a sudden people think I'm a programmer."

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Symphony's DOS add-in can get you into the same situation. You won't have a problem in 1-2-3 *Release 1A, because the System command is not available.*

FLASHING MEM INDICATOR II

I'd like to share a technique that's different from the one R. C. Mathiessen described in the September issue. When you have ranges of data with formulas whose values won't change, you can use the Range Value [in *Symphony*, Range Values] command to convert formulas to values. This may free up RAM so that you can create larger worksheets. Recently, by using this method, I reduced from 98% to 46% the amount of conventional memory my worksheet used.

John R Christensen
Columbus, Ind

The Range Value command is not available in 1-2-3 *Release 1A.*

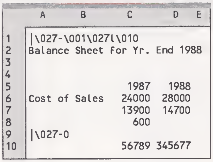
HARDWARE

EPSON SETUP STRINGS

You can use a setup string for the Epson FX-286 printer in your *1-2-3* spreadsheets to underline one or more rows. The setup string is \027-\001. You can also use the following two variations to customize and improve the appearance of the underlined output.

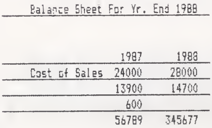
If, for example, you want a left margin of 10 and you want the underline to begin at the left margin, set the left margin to 0 and use this variation: \027-\001\027l\010. The string \027l\010 within the setup string sets the printer's left margin (indicated by the lowercase L before the second backslash) to 10 characters. The string \027-\001 causes the printer to underline each row.

You may want the underline to extend to the rightmost column of each row, but there may be no entries in the rightmost cell for some rows. If this is the case, set the width of the column to the right of your Print range to 1. Type a nonprinting ASCII code in each cell in this column that corresponds to a row in your Print range. For example, in the following worksheet set the width of column E to 1, enter *@CHAR(1)* in cell E2, and copy the formula to range E5..E8 and to cell E10. Don't forget to include column E in your Print range (A1..E10).



```
      A         B         C          D   E
 1  |\027-\001\027l\010
 2  Balance Sheet For Yr. End 1988
 3
 4
 5                        1987     1988
 6  Cost of Sales        24000    28000
 7                       13900    14700
 8                         600
 9  |\027-0
10                       56789   345677
```

Your printed worksheet will appear as follows:



```
   Balance Sheet For Yr. End 1988



                         1987      1988
   Cost of Sales        24000     28000
                        13900     14700
                          600
                        56789    345677
```

Dennis B Shields
Saratoga, Calif

You can use the setup string either by selecting /Print Printer Options Setup or by embedding it in the spreadsheet to underline only some rows. To underline selected rows, position the cursor in the leftmost column of your Print range in a blank row just above the range you want underlined. Then enter two split vertical bars (¦¦), followed by the setup string. To end the underlining, enter the string \027-0, as shown in cell A9. The rows that contain the setup string won't be printed. These setup strings also work in all versions of Symphony. *You cannot embed setup strings in* 1-2-3 *Release 1A spreadsheets.*

PRINTING REPORTS WITH 1-LINE TO 5-LINE SPACING

I have an Epson FX-100 printer, and I use *1-2-3* Release 2. Sometimes I have to print double-spaced reports and sometimes five-line-spaced reports. The Epson FX series printer manual tells how to set line spacing to any number needed. The control code for line spacing is:

<ESC>"A"CHR$(n)

This control code sets spacing to *n*/72 inch. The <ESC> is equivalent to the ASCII code 027, and the A is equal to ASCII 193. The default line spacing is 1/6 inch or 1*72/6, which is equal to 12. Since the printer is set to single spacing, you need not enter a setup string to print a single-spaced report. Using an ASCII conversion table from the Epson manual, I developed the following table to show the setup strings that produce different line spacings.

Spacing	***n*/6**	***n*/72**	***n***	**Setup string**
single	1	1*72/6	12	\027\193\012
double	2	2*72/6	24	\027\193\024
triple	3	3*72/6	36	\027\193\036
quadruple	4	4*72/6	48	\027\193\048
quintuple	5	5*72/6	60	\027\193\060

Note that you must use three-digit numbers to represent ASCII codes in a setup string. For example, ASCII code 12 in a setup string becomes 012.

Mary Ann King
Queens, NY

You can use the same setup strings, called initialization strings in Symphony, *to set line spacing for your printed reports. You can also use the spacing setting in the Print Settings sheet (SERVICES Print Settings Page Spacing) to set line spacing to single, double, or triple spacing.*

PRINTING GRAPHS ON THE HP 7550A PLOTTER

I run *1-2-3*'s PrintGraph utility on a Zenith Z-158 PC to produce charts on an HP 7550A plotter. The Z-158 can operate at either 4.77 MHz or 8 MHz. When the computer is running at 8 MHz, the plotter responds with a number of erratic error messages. However, when I lower the computer's clock speed to 4.77 MHz, there is no trouble. I didn't encounter this problem with the Z-159 PCs.

Steve Salisbury
Whirlpool
Benton Harbor, Mich

This material is prepared by Subhadra Mattai and the Technical Editors, with the help of the Lotus Product Support staff.

WRITE US

Do you have a favorite technique or way of using your Lotus products or of keeping your hardware and software on speaking terms? Share it! We'll send you $25 if we print your letter. Send them to: Good Ideas, LOTUS *Magazine, P.O. Box 9123, Cambridge, MA 02139–9123.*

It's always the raw speed of an application that seems to catch one's attention. But when you think about it, speed alone doesn't always determine the amount of useful work you can produce.

That's why in dBASE IV,™ we added more than just a blazingly fast .EXE compiler. We added a total of 310 new or enhanced commands and functions that help you complete your applications in less time than you ever thought possible.

And without your having to become a full-fledged programmer to do it.

Of course, the compiler by itself lets you run applications significantly faster than is possible with dBASE III PLUS.™ But you'll also find yourself working much more efficiently through dBASE IV's intuitive new Control Center. As well as by using its Applications Generator. Or the Report Writer. The Forms Generator. And much more.

After all, when it comes to developing dBASE IV applications more quickly, there's not just one way to do it.

There is one way to find out more, though. Just visit your local authorized Ashton-Tate dealer for a demonstration, or call **800-437-4329* ext. 2934** for details on videotapes, demo disks, upgrades, and more.

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"Have you noticed that program speed is not the only reason you get things done faster?"

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This is for ev too busy to get

If you're the type of person who's too busy to read an ad, read this ad.

Because you'll learn about a new tool that will help you manage people, ideas, projects, and information with incredible efficiency. A tool that will help you avoid slumping into your chair, shaking your head, and asking, "How on earth will I ever get this done?"

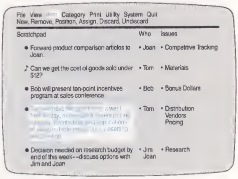
Dump any random, unrelated thoughts or ideas into Agenda, and it'll help you turn that information into a stream of structured, actionable knowledge.

We call it Lotus® Agenda®, the personal information manager.

Agenda allows you to dump random facts, thoughts, and ideas into your PC without having to structure the information in advance.

Agenda's filing system is a more sophisticated version of this filing system. You can put items anywhere you want. View them any way you want. And have access to them anytime you want.

You can record the thousands of tasks you need to address to put together a new product line. Or the thousands of factors you need to put together a new bottom line.


File View Item Category Print Utility System Quit
New, Remove, Position, Assign, Discard, Undiscard

Scratchpad	Who	Issues
● Forward product comparison articles to Joan.	• Joan	• Competitive Tracking
♪ Can we get the cost of goods sold under $12?	• Tom	• Materials
● Bob will present ten-point incentives program at sales conference	• Bob	• Bonus Dollars
● [illegible] a week from Friday, [illegible] buyers pricing [illegible] distribution and applications [illegible] outside [illegible] typesetting [illegible]	• Tom	• Distribution Vendors Pricing
● Decision needed on research budget by end of this week--discuss options with Jim and Joan	• Jim Joan	• Research

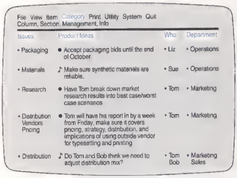
Items. Dump information in manually, import it or use our pop-up capability while in another program.

Agenda will not only file these random items of information for you, it'll help you arrange them any way you want.

So you can understand them better, formulate new ideas better and extract all the answers you need better.

Which means, now you can concentrate

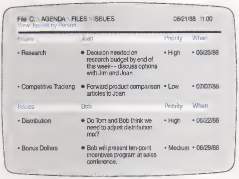
eryone who's any work done.



File View Item Category Print Utility System Quit
Column, Section, Management, Info

Issues	Product Ideas	Who	Department
• Packaging	● Accept packaging bids until the end of October	• Liz	• Operations
• Materials	♪ Make sure synthetic materials are reliable.	• Sue	• Operations
• Research	● Have Tom break down market research results into best case/worst case scenarios	• Tom	• Marketing
• Distribution Vendors Pricing	● Tom will have his report in by a week from Friday, make sure it covers pricing, strategy, distribution, and implications of using outside vendor for typesetting and printing	• Tom	• Marketing
• Distribution	♪ Do Tom and Bob think we need to adjust distribution mix?	• Tom Bob	• Marketing Sales

Categories. Agenda files items in all relevant categories so you can always find the information you need.



File C:\AGENDA\FILES\ISSUES 06/21/88 11:00
View Issues by Person

Issues	Joan	Priority	When
• Research	● Decision needed on research budget by end of this week-- discuss options with Jim and Joan	• High	• 06/25/88
• Competitive Tracking	● Forward product comparison articles to Joan	• Low	• 07/07/88
Issues	**Bob**	**Priority**	**When**
• Distribution	● Do Tom and Bob think we need to adjust distribution mix?	• High	• 06/22/88
• Bonus Dollars	● Bob will present ten-point incentives program at sales conference.	• Medium	• 06/29/88

Views. Looking at the same information through different views gives you a more informed perspective.

more on using and acting on your information. And less on processing it.

How does Agenda work?

The whole idea behind Agenda is to get them all in a row.

First, enter your items of information into your PC and assign them to categories that you create.

Then Agenda will do all of your filing automatically. And thanks to Agenda's *multiple filing capabilities*, if the information is relevant in more than one place, Agenda will take it and put it in several categories at once.

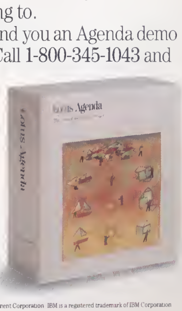
This makes it easy to view your data in different ways so you can pinpoint information that's important to you. Or discover new relationships you hadn't considered before. And anytime you change an item in a view, Agenda will automatically update all other categories where the item has been assigned.

In fact, you could say that Agenda recalculates your text the way a spreadsheet program recalculates numbers.

All of which means, from now on you'll be able to come in every morning, check your Agenda, and get right to work.

Because you'll immediately know what work needs getting to.

For $15, we'll send you an Agenda demo kit or videotape. Call 1-800-345-1043 and ask for demo kit AKQ-3058 for the 3.5″ version or AKQ-3053 for the 5.25″ version. Or ask for videotape AKQ-3063.



Introducing Lotus Agenda

Agenda and Agenda Demo Kit require an IBM® PC or compatible, with 640K and a hard disk, DOS 2.0 or higher. Lotus and Agenda are registered trademarks of Lotus Development Corporation. IBM is a registered trademark of IBM Corporation.

JETFONT 12/3 CARTRIDGE

Laser printer owners: Print more of your worksheet on a single page.

BY MARC DAVIDSON

If you use any Hewlett-Packard LaserJet printer or the Canon LBP-8II, you can use the JetFont 12/3 Cartridge to squeeze more characters on each line of your worksheet printout.

Without JetFont, you could fit more data across the 8½-by-11-inch paper your laser printer uses by printing in landscape mode—that is, sideways across the page. Or you could reduce the type size to squeeze more characters on each line. Or you could combine both methods. For example, you could print your spreadsheet in landscape mode with the HP LaserJet's smaller Line Printer font.

Any of these techniques may solve your problem some of the time, but they still limit you to 176 characters per line. If your spreadsheet is any wider than that, you have to print it one print range at a time and tape the pages together. Consider, too, that if you intend to include the worksheet printout in a bound report, both landscape mode and taping are often unacceptably awkward.

JetFont offers a more effective solution. The cartridge, which plugs into a slot in your laser printer, contains a font that can print twice as many characters on a line as your HP LaserJet's native Line Printer font. That may enable you to print the entire width of your worksheet without forcing you to print in landscape mode.

> USING JETFONT'S SMALLEST FONT, YOU CAN PRINT A SPREADSHEET THAT'S 240 CHARACTERS WIDE ON A SINGLE PAGE

JetFont 12/3 Cartridge's fonts also lend a legible, higher-quality appearance to your worksheets. That's especially important when you use smaller type because as you reduce type size, you also reduce legibility.

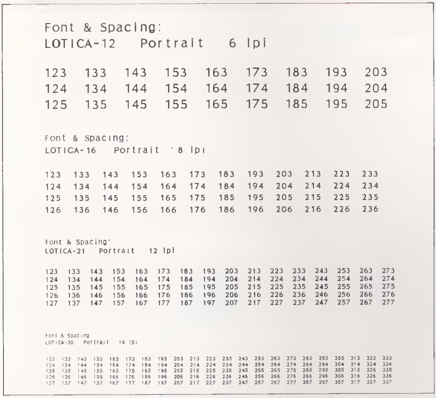
SMALLER FONT SIZES

The JetFont 12/3 Cartridge plugs into your Hewlett-Packard or Canon laser printer like any font cartridge provided by the printer manufacturer. The cartridge contains eight fonts, all of which use Lotica, a sans serif typeface (see printout on next page). The fonts encompass landscape and portrait (vertically oriented on the page) versions of Lotica in the following densities: 12 characters per inch (cpi), 16 cpi, 21 cpi, and 30 cpi. (Since the time of this review, the manufacturer has added 18-cpi and 25-cpi densities in landscape and portrait versions.)

Lotica-21, or Lotica typeface in 21-cpi size, can print almost a third again as many characters per line as the LaserJet's 16-cpi Line Printer font. Using Lotica-21 in landscape mode, you can print a spreadsheet that's 220 characters wide on a single sheet of 8½-by-11-inch paper. Assuming that your average column is

Mark Davidson is a free-lance writer and a frequent contributor to LOTUS.

KIMBERLEY BRY



```
Font & Spacing:
LOTICA-12   Portrait   6 lpi

123  133  143  153  163  173  183  193  203
124  134  144  154  164  174  184  194  204
125  135  145  155  165  175  185  195  205

Font & Spacing:
LOTICA-16   Portrait  ˙8 lpi

123  133  143  153  163  173  183  193  203  213  223  233
124  134  144  154  164  174  184  194  204  214  224  234
125  135  145  155  165  175  185  195  205  215  225  235
126  136  146  156  166  176  186  196  206  216  226  236

Font & Spacing'
LOTICA-21   Portrait   12 lpl

123  133  143  153  163  173  183  193  203  213  223  233  243  253  263  273
124  134  144  154  164  174  184  194  204  214  224  234  244  254  264  274
125  135  145  155  165  175  185  195  205  215  225  235  245  255  265  275
126  136  146  156  166  176  186  196  206  216  226  236  246  256  266  276
127  137  147  157  167  177  187  197  207  217  227  237  247  257  267  277

Font & Spacing
LOTICA-30   Portrait   16 lpi

123  133  143  153  163  173  183  193  203  213  223  233  243  253  263  273  283  293  303  313  323  333
124  134  144  154  164  174  184  194  204  214  224  234  244  254  264  274  264  294  304  314  324  334
125  135  145  155  165  175  165  195  205  215  225  235  245  255  265  275  285  295  305  315  325  335
126  136  146  156  166  176  186  196  206  216  226  236  246  256  266  276  266  296  306  316  326  336
127  137  147  157  167  177  187  197  207  217  227  237  247  257  267  277  287  297  307  317  327  337
```

This sample printout includes 4 of the 12 Lotica fonts now available in the JetFont 12/3 Cartridge. Each font is shown in its actual size. Note: lpi means lines per inch.

nine characters wide, you can print a 24-column spreadsheet, such as a 24-month sales forecast, on a single page.

Lotica-30, the smallest font, yields roughly twice as many characters per line as the Line Printer font. In portrait mode you can print a spreadsheet that's 240 characters wide. However, you can't get more characters across the page by switching to landscape mode because *1-2-3* and *Symphony* limit you to 240 characters per printed line.

These small fonts also let you print more lines per page. For example, Lotica-16 gives you plenty of room for 8 lines per inch, and you can squeeze as many as 12 lines per inch without having to worry about overlapping lines. Most standard 10-cpi and 12-cpi fonts can fit only 6 lines per inch. Lotica-21 lets you easily print 12 lines per inch, and Lotica-30 lets you print as many as 16 lines per inch.

READABILITY

Of course, if you can't read these small characters, it doesn't matter how many of them you can fit on a page. When I tested the fonts, I found that, compared with the 16-cpi Line Printer font, Lotica-16 is more readable and Lotica-21 is as readable. Three other people compared the fonts, and they also found Lotica-16 easier to read than the Line Printer font. Two of the three felt that Lotica-21 was as clear as the Line Printer font.

The smallest font, Lotica-30, is legible, but you may need your reading glasses. As a worst-case test, I ran a spreadsheet printed in Lotica-30 through seven generations of photocopies. The numbers remained clear throughout.

You should adhere to one objective standard when choosing a font to print your spreadsheets: With one exception, no matter what size font you choose, the font must use fixed spacing. The exception occurs if you use *Allways* ($149.95, from Funk Software, Cambridge, Mass.), which lets you use proportional fonts too. In a fixed-spaced font, each character takes up the same amount of space, whether it's a narrow character like the number 1 or a wider character like the number 5. Fixed spacing keeps your numbers lined up in the proper decimal places and keeps your column edges straight and well defined, even when the space between columns is narrow. All eight Lotica fonts use fixed spacing, which you'll appreciate as you try to squeeze more columns and rows onto a single printed page.

CONTROL STRINGS

To select a Lotica font, you enter the appropriate setup string in your Print menu. The manual spells out the setup strings for each Lotica font, including variations for adjusting the number of lines per inch. You simply type in the complete strings as you need them. If you use *JetSet* ($79.95, from Intex Solutions, Needham, Mass.), you can skip the lengthy setup strings and select Lotica fonts from *JetSet*'s menu (see *JetSet* review in the February 1988 issue).

You can use Lotica fonts as you would any other font. If you use JetFont with *1-2-3* Release 2/2.01 or with any release of *Symphony*, you can combine several Lotica fonts on the same page by embedding the different setup strings in the spreadsheet itself. When you embed a setup string for a font, JetFont prints everything below the string in that font until it encounters a new string.

By embedding these setup strings in the worksheet, you gain flexibility over the final appearance of your printout. If certain sections of your worksheet are wider than others, you can print only the wider sections in a smaller Lotica font instead of either printing the entire print range in a smaller font or printing the entire print range in landscape mode to accommodate the wider sections. You can also print explanatory text in a larger font and print the rest of the worksheet in a smaller font so that everything fits on the same page.

The JetFont cartridge can print the Lotus International Character Set, but only when you use the cartridge with HP laser printers. Note, too, that while the cartridge has been designed with *1-2-3* users in mind, it also works with any other program that lets you send control codes to the printer. ■

IN BRIEF

JetFont 12/3 Cartridge Version 1.0. Computer Peripherals, 667 Rancho Conejo Blvd., Newbury Park, CA 91320; 805-499-5751, 800-854-7600. Requires HP LaserJet, HP LaserJet Plus, HP LaserJet Series II, or Canon LBP-8II laser printer. Includes sample worksheets for *1-2-3*. Released 12/87. $325 Limited two-year warranty on materials and workmanship.

SPREADSHEET TOOLBOX

No-frills sideways printing, cell annotation, file compression, and more

BY TOM CARLTON

If you want to print your *1-2-3* or *Symphony* worksheets sideways, attach notes to your cells, or compress your worksheet files, utilities such as *Duet* from Consumers Software (Santa Cruz, Calif.), *Sideways* from Funk Software (Cambridge, Mass.), *Note-It! Plus* from Turner Hall Publishing (Cupertino, Calif.), and *Sqz! Plus*, also from Turner Hall, will work just fine. If you need to do all those things and more, Consumers Software's *Spreadsheet Toolbox* can save you money. At $99.95, this collection of six utilities will cost you less than buying two or more popular utilities at $70 to $150 each.

A number of caveats undermine this apparent bargain, however. First, if you know a bit about *1-2-3* or *Symphony*, *Spreadsheet Toolbox* might just as well be five products in one instead of six: You can duplicate the function of the CleanSlate utility via either Lotus program's menu. Second, *Toolbox*'s data-recovery program doesn't work with compressed files of any kind, so if you damage a file that has been compressed with *Toolbox*'s Compact program, you're out of luck. And third, you can use only two of the six programs—Cell Memo and Compact—while *1-2-3* or *Symphony* is active. You must run the other four from DOS. But if you can live with these shortcomings and you're satisfied with each utility's no-frills functionality, *Spreadsheet Toolbox* may be the low-cost solution you've been waiting for.

PRINTING SIDEWAYS

Toolbox's Sidewriter utility is similar to *Duet* and *Sideways*. It lets you print spreadsheets of any width by rotating them 90 degrees and printing them sideways on the page. You can choose from 12 font sizes, depending on the kind of printer you use. You can also increase your choices by modifying any of the existing fonts and adding them to the original ones.

KIMBERLEY BRY

Unlike *Duet* and *Sideways*, Sidewriter won't work while you're in *1-2-3*. Instead, you must suspend *1-2-3* with the System command or end your *1-2-3* session before running Sidewriter from the DOS prompt. If you use Sidewriter during a suspended *1-2-3* session, you run the risk of having insufficient memory to load both Sidewriter and the worksheet you want to print. Sidewriter cannot take advantage of expanded memory.

Printing sideways is always slower than normal printing, and printing with Sidewriter is no exception. Running on an 80386-based computer, Sidewriter took about 10 minutes to print each page. I found that by installing a print buffer, I could speed this up to about three minutes per page. *Duet* and *Sideways* are no faster, but *Duet* prints in the background, so you can resume your spreadsheet work once printing is under way.

Sidewriter comes with more than 100 drivers for a variety of dot-matrix printers, but choosing the right one may be troublesome. Drivers are grouped by printer manufacturer, but nowhere is there a mention of which printer driver you should use with a particular model. I had to determine by trial and error which of four Toshiba drivers worked with my printer. This is an annoying oversight, especially for a nontechnical user.

ATTACHING NOTES

With *Toolbox*'s Cell Memo utility, you can attach pop-up notes to spreadsheet cells, file names, or directory names. You can assign one note per cell, up to 209 cells per file, and each note can contain up to 530 characters. Cell Memo's capacity is much smaller than *Noteworthy*'s (unlimited notes per file, 8,000 characters per note), about equal to *Note-It*'s (250 notes per file, 500 characters per note), and greater than *SmartNotes*' (125 notes per file, 230 characters per note).

Cell Memo contains the same basic functions as the three popular products mentioned above. You can edit your notes, search for a note that contains a specific number or text string, and print your notes (via a separate print command for cell notes).

The program, however, lacks some of its competitors' special features. Cell Memo doesn't let you copy text from your spreadsheet to your notes, which means that if you want to create a note to explain a particularly complex formula, you have to retype the formula into the note. You can't change the size or the position of a note window on the screen, which means that you often can't prevent a note from obscuring relevant cells. If

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you want to use pop-up notes to create a help facility for your larger worksheets, these missing features and the program's limited capacity for notes could easily hinder you.

To read a note, you can move your cursor to the cell containing the note and press a "hot key," or you can choose the note from Cell Memo's pop-up directory. Because you can include a short description of your notes in the directory, you can find a particular note without scrolling around the spreadsheet or trying to remember which cell contains the information you want.

I encountered one significant bug in Cell Memo. If you copy a cell containing a note into itself, such as you'd do to cell B2 if you copied it to B2..B10, Cell Memo fills up the remaining space in the cell-note directory with copies of the directory entry for the copied cell. With the cell-note directory full, you can't list any new cell memos. What's worse, you'll have to delete those copied entries one by one.

RECOVERING DATA

In many cases *1-2-3* and *Symphony* will fail to retrieve partially damaged worksheet files. Even if only a small portion of your file sustains damage, all data in that file may be rendered inaccessible. The Fix-It utility recovers data from files damaged by a bad disk sector or from files that have been partially overwritten by another file.

In my tests, no matter how badly the file was damaged, Fix-It was able to recover most or all of the undamaged portion of the worksheet. Some programs that can recover data from damaged files work only if this damage does not affect the area of the file containing the global worksheet settings. Fix-It worked effectively whether the damage occurred to the global settings or to the worksheet data.

Fix-It cannot recover erased files or files located on a physically damaged portion of a disk, but it may prove a valuable complement to programs that can. For instance, you can use *The Norton Utilities* to recover an accidentally erased file, but if the file was partially overwritten before you recovered it, *1-2-3* would still refuse to load it. In such a case, you can use Fix-It to recover any data that was not overwritten.

Unfortunately, if you damage a file compressed with Compact, *Toolbox*'s file-compression utility, you can't use *Spreadsheet Toolbox* to recover the remaining undamaged data. Fix-It cannot recover data files compressed with Compact. Fix-It's inability to work with Compact is hard to understand because it partially negates the appeal of *Spreadsheet Toolbox*'s all-in-one approach. If you need to compress your worksheet files and you want protection against file damage, you'd be better off with *Sqz! Plus*, which includes a data-recovery program that works with files *Sqz! Plus* has compressed (see September 1988 review).

COMPRESSION

Compact is similar to *Sqz! Plus*. In my tests, if worksheets contained mostly numbers and formulas, Compact compressed them slightly more than *Sqz! Plus* did; if worksheets contained mostly labels, such as databases or mailing lists, Compact compressed them much more effectively than *Sqz! Plus* did. *Sqz! Plus* performed slightly better than Compact did when compressing worksheets that contained a more even mix of numbers, formulas, and labels.

WORKSHEET COMPRESSION COMPARISON

Worksheet Contents	Sqz! Plus	Compact
Numbers and formulas	52% to 76%	54% to 80%
Labels	25% to 43%	84% to 93%
Business analysis	76% to 83%	73% to 80%

Reduction in file size after compression. The business-analysis files include a combination of numbers, formulas, and labels.

Like *Sqz! Plus*, Compact works automatically as you use *1-2-3* or *Symphony*'s File commands. The utility automatically compresses a file when you save it or extract it to disk and automatically uncompresses a file when you retrieve it or combine it with another file.

Not only does Compact prevent you from using Fix-It, but it also makes Compare, the worksheet-comparison utility, much less convenient to use. Before using Compare with two compressed files, you'll have to uncompress one of them. That means a few extra steps. On top of that, the manual doesn't tell you which worksheet to uncompress. That's a more serious oversight, because if you uncompress the wrong worksheet, Compare sometimes falsely reports that your spreadsheet is "corrupted."

COMPARING AND CLEANING UP

The Compare utility reports the differences between two versions of the same worksheet. For any two worksheet files, Compare lists the contents of any corresponding cell addresses whose contents differ and compares worksheet settings, named graph settings, and named ranges. You can use the program to compare an older version of a worksheet with a newer one or with a version edited by someone else.

The CleanSlate utility removes all the numerical cell entries from a worksheet file, leaving only your labels, formulas, and macros. You can obtain the same result using the File Combine Subtract Entire-file command and specifying the name of the current worksheet. Because the File Combine command is part of *1-2-3* and *Symphony* and CleanSlate is not, once you know about this command, there's no reason to use CleanSlate.

One convenience common to all six utilities is the Tree Walker, a pop-up window that displays all files in your current subdirectory and lets you select the file you want to work on. If the file you want is not in the current subdirectory, you can use your arrow keys to move through other subdirectories until you find the file you need. Tree Walker pops up whenever you're prompted to specify a file name while using any of the six utilities.

A final note: For *1-2-3* you must install *Spreadsheet Toolbox* to work with either LOTUS.COM or 123.COM (for *Symphony*, ACCESS.COM or SYMPHONY.COM), and this can be inconvenient. If you choose LOTUS.COM or ACCESS.COM, you'll have to go through *Toolbox*'s main menu and the Lotus menu to get to your spreadsheet. If you choose to use 123.COM or SYMPHONY.COM, you have to call PrintGraph, Translate, or Install from DOS when needed. ■

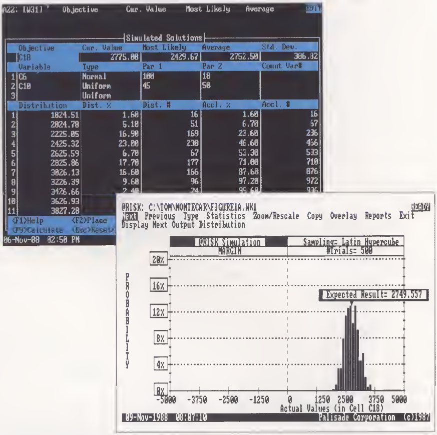
IN BRIEF

Spreadsheet Toolbox Version 1.0 Consumers Software, 736 Chestnut St., Santa Cruz, CA 95060; 800-645-5501, in Calif. 800-556-6699. Runs on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Works with all *1-2-3* releases and *Symphony* Releases 1, 1.01, 1.1, and 1.2. Released 7/88. $99.95; 60-day, money-back guarantee if ordered through manufacturer. Available on 5¼-inch disks; 3½ disks available by request (free of charge).

@RISK AND SIMULATED SOLUTIONS

Risk analysis prepares you for the unexpected.

BY TOM CARLTON



```
A22: [W31] '   Objective       Cur. Value     Most Likely    Average          EDIT

                          |Simulated Solutions|
   Objective           Cur. Value     Most Likely   Average       Std. Dev.
  |C18                    2775.00|      2429.67|      2752.50|       386.82
   Variable            Type           Par 1         Par 2         Count Var#
 1|C6                  Normal        100           10
 2|C10                 Uniform       45            50
 3|                    Uniform
   Distribution        Dist. %        Dist. #       Accl. %       Accl. #
 1|          1824.51|         1.60|           16|         1.60|           16
 2|          2024.78|         5.10|           51|         6.70|           67
 3|          2225.05|        16.90|          169|        23.60|          236
 4|          2425.32|        23.00|          230|        46.60|          466
 5|          2625.59|         6.70|           67|        53.30|          533
 6|          2825.86|        17.70|          177|        71.00|          710
 7|          3026.13|        16.60|          166|        87.60|          876
 8|          3226.39|         9.60|           96|        97.20|          972
 9|          3426.66|         2.40|           24|        99.60|          996
10|          3626.93|
11|          3827.20|
  <F1>Help      <F2>Place
  <F9>Calculate  <Esc>Reset>
06-Nov-88  02:50 PM
```

```
@RISK: C:\TOM\MONTECAR\FIGURE1A.WK1                                   READY
Next  Previous  Type  Statistics  Zoom/Rescale  Copy  Overlay  Reports  Exit
Display Next Output Distribution
```

***Simulated Solutions* (background) uses a form to specify the input variables' probability distributions and the output cell. The same form also displays the result of the simulation. *@Risk* (foreground) displays the results of Monte Carlo-simulation in a graph.**

What do you do about the risks you encounter when you invest funds, project sales, estimate operating costs, or forecast the business climate? Monte Carlo–simulation programs, such as the *1-2-3* add-ins *@Risk* and *Simulated Solutions* (which is sold as part of Enfin Software's *Business Planner* package), can help you predict the impact of those risks on your bottom line.

In spreadsheet analysis, risk means that you're uncertain of the value of one or more input variables. If your analysis involves only one or two such variables, you can use *1-2-3*'s Data Table command to determine the range of outcomes based on the possible values for each variable. When you need to work with many uncertain input variables, either *Simulated Solutions* or *@Risk* can substantially reduce the work you'd otherwise face.

In Monte Carlo analysis, you specify a probability distribution, such as a normal or a uniform distribution, that describes the possible values of each uncertain input variable. Both *Simulated Solutions* and *@Risk* select a value for each variable from that variable's associated probability distribution, recalculate the worksheet, save the calculated value for the specified output cell, and then repeat the cycle.

The result of the analysis is the distribution of values for each output cell and the statistics, such as the mean and the variance, for this distribution. The more times the programs repeat the cycle described above, the more accurately the resulting distribution will represent the actual probability of outcomes.

Compared with the risk-analysis program *Delta-Manager*, which we reviewed in December, *Simulated Solutions* and *@Risk* are better programs for general business use. *Delta-Manager*'s calculations are based on strict assumptions about the statistical behavior of the entire model, not just that of the input variables. If the business relationships embodied in your model don't support those assumptions, you will probably get the wrong answer. Those limits don't constrain either Monte Carlo–simulation program, and that makes these programs easier to learn and use. If you study *@Risk*'s manual carefully, you may be able to use the program even if you have no background in statistics. *Simulated Solutions* requires some background in statistics and in Monte Carlo analysis.

PERFORMANCE

While both *Simulated Solutions* and *@Risk* do a good job of performing Monte Carlo analysis, *@Risk* outperforms its rival. It lets you simultaneously obtain results for multiple output cells. You might use that to calculate monthly prof-

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Tom Carlton, a frequent contributor to LOTUS, *is manager of corporate analysis at a midwestern Fortune 500 firm.*

its for an entire year. With *Simulated Solutions*, you'd have to run the same simulation once for each month, or 12 times, to obtain the same result. Since these programs recalculate the worksheet once for each iteration, and a typical single run includes 1,000 to 1,500 iterations, that time savings can be significant. Furthermore, *@Risk* analyzes even single outputs more quickly. Because of its sampling method (Latin hypercube), the program requires fewer iterations to reach a given level of accuracy. You'll save about 60% of the time *Simulated Solutions* needs to do the same job.

YOU CAN USE @RISK EVEN IF YOU HAVE NO BACKGROUND IN STATISTICS. SIMULATED SOLUTIONS REQUIRES SOME FAMILIARITY WITH STATISTICS AND MONTE CARLO SIMULATION.

@Risk's ability to correlate two or more input probability distributions will simplify your modeling work. For example, if you want to build a model of the construction industry and specify that when interest rates rise, housing starts fall, you can build that into the probability distribution. In *Simulated Solutions*, you have to build the relationship into the logic of your worksheet model, which is a more difficult task.

@Risk and *Simulated Solutions* use different methods to specify probability distributions for uncertain input variables. *@Risk* lets you use 30 different @functions in your formulas to specify different types of probability distributions. Unfortunately, once you write those @functions into your formulas, the *@Risk* add-in must be attached to the worksheet or the formulas containing the @functions evaluate to NA. Two of *@Risk*'s @functions enable you to correlate two or more dependent probability-distribution @functions with a distribution @function. This capability is both the simplest method of correlating variables and the easiest method to document of the three risk-analysis products reviewed so far.

With *Simulated Solutions*, you can easily analyze an existing worksheet without changing it. On a special form you specify up to 20 input cells, or ranges of input cells, and their associated probability distributions. The disadvantage of this approach is that if you want to incorporate the uncertain inputs into formulas, you must break them out into separate cells.

SEEING RESULTS

Regardless of how you feel about the @function approach versus the input-form approach, *Simulated Solutions* has one distinct advantage. You select a menu item to view the results from your worksheet. You can then select another menu item to copy the results into your worksheet for further analysis. To see the results of *@Risk*'s work, you must exit from *1-2-3* and load *@Risk's* RiskGraph program. With RiskGraph you can then save any of the numeric results and import them into a worksheet. The program automates the saving and importing operations, but the process is time-consuming and won't work if you've loaded *Sqz!* or any of several other popular utilities.

RiskGraph displays the results of *@Risk*'s analysis in a graph. It also displays the mean, standard deviation, skewness, and kurtosis statistics for each output cell. RiskGraph can also generate PIC files so that you can print graphs of the results.

Simulated Solutions generates a distribution table for the value in the output cell and gives the mean, the most probable value, and the standard deviation for the values of the output cell. The distribution table appears in the same form used to specify the input cells and output cell (see figure). A menu command lets you save the contents of the form into your worksheet, where you can graph the distribution table with *1-2-3*.

A CAVEAT

I did encounter one bug in *Simulated Solutions*. When analyzing a spreadsheet with two independent, uncertain input variables, one with a normal probability distribution and one with a uniform probability distribution, the program yielded an incorrect result. In one such case, the program calculated the uncertainty of the output to be 24% greater than it should be. Of all the combinations of variables I tested, this was the only one that posed a problem; when I added a third input variable to the same spreadsheet, the results were accurate. If you use this particular combination of variables with *Simulated Solutions*, check your results for evidence of this bug. One test is to create a graph of the distribution table. If your distribution curve is two-humped instead of one-humped, then this bug has affected your results.

Simulated Solutions comes in two versions; one is limited to five probability distributions and the other, *Simulated Solutions Plus*, to 20. The first version comes with normal and uniform distributions plus three types of user-defined distributions, which is all you need in most financial-planning situations. If your worksheet model simulates a physical process, such as queuing or inventory management, you will likely need distributions beyond those five.

If you also want to perform goal seeking and linear programming, *Simulated Solutions Plus* is available in a package called Decision Support One, which contains add-ins that perform those functions. ■

IN BRIEF

@Risk Version 1.02. Palisade Corp., 2189 Elmira Rd., Newfield, NY 14867; 800-432-RISK. Available on 5¼-inch and 3½-inch disks; runs with *1-2-3* Release 2/2.01 on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. Requires between 70K and 89K of RAM, plus 20K for the *1-2-3* Add-In Manager and a CGA, EGA, VGA, or Hercules Graphics Card. Released 4/88. $395; 90-day defective-disk warranty, 30-day money-back guarantee

Simulated Solutions Version 2.30, available in *Business Planner* Version 3.0. Enfin Software Corp., 6920 Miramar Rd., Suite 106-A, San Diego, CA 92121; 800-922-4372, in Calif. 800-722-4372. Available on 5¼-inch or 3½-inch disks; runs with *1-2-3* Release 2/2.01 and any version of *Symphony* on the IBM PC, PC XT, PC AT, PS/2, and compatible computers. *Simulated Solutions* requires 40K of RAM plus 20K for the *1-2-3* Add-In Manager. Released 8/87. $149; 30-day return policy.

Simulated Solutions Plus Version 1.20. $295.

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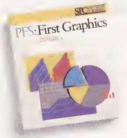

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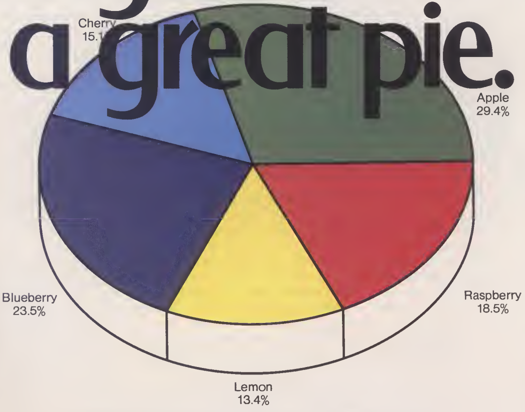

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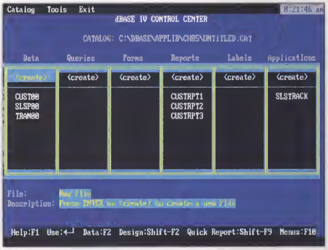
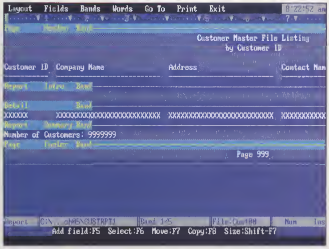
dBase IV: A Faster, Easier, and Backward-Compatible dBase



***dBase IV* organizes all the files associated with an application and provides access to them through the menu-driven Control Center.**


Layout Fields Bands Words Go To Print Exit
8:22:52 am
Customer Master File Listing
by Customer ID
Customer ID
Company Name
Address
Contact Nam
XXXXXX
Number of Customers: 9999999
Page 999
Add field:F5 Select:F6 Move:F7 Copy:F8 Size:Shift-F7

***dBase IV*'s new report generator represents your report symbolically, much the same as Borland International's *Paradox*.**

The most recent release of *dBase* has a new menu-driven interface, an enhanced programming language, and new application-development tools. *dBase IV* will run *dBase III Plus* applications and is two to three times faster, as well as easier to use.

The menu-driven interface, called the Control Center, replaces *dBase III*'s Assistant. Like the Assistant, it lets you create databases, data-entry forms, queries, and reports. For queries and reports, instead of using the Control Center, you can use Structured Query Language. Ashton-Tate says that the syntax in its version of SQL is consistent with IBM's version. Nonetheless, *dBase*'s SQL works only with *dBase* files.

On networks, the program makes it simpler for people to use a file simultaneously because it automatically locks files and records. That feature reduces the number of modifications required to convert single-user *dBase III Plus* or *dBase IV* applications into multiuser applications. Another important feature for network-based use, transaction rollback, ensures that users can reconstruct their work if the network goes down during data entry.

dBase IV makes it easier to create automated applications. Without using *dBase*'s built-in programming language, you can create the procedures and menus to automate applications and incorporate into them the forms, queries, and reports created with the Control Center.

For people who program, the more than 300 enhancements to the programming language should help. Among them are the ability to use up to 47 indexes in one file, a simpler way of validating data, the ability to create user-defined functions, and a debugger that can set break points for testing new applications. *dBase IV* also increases the maximum number of editable lines in the program editor (32,000 lines versus 4,096 characters), the maximum number of open files (99 versus an effective maximum of 15), and the maximum number of procedures called by a procedure file (963 versus 32).

The price of this new power and ease of use is an increase in hardware requirements. The program requires 4 megabytes of space on a hard disk and 640K of RAM. Depending on your application, adding a math coprocessor may significantly speed up *dBase IV*.

A separate Developer's Edition of *dBase IV* includes an object-code linker, a run-time package, and a compiler for the *dBase IV* programming language. The linker allows you to combine application files into a single file to increase efficiency. The run-time package allows you to distribute, at no extra charge, an unlimited number of compiled applications that their recipients can use without *dBase IV*.

Purchasers of *dBase IV* Version 1.0 will receive Version 1.1 at no charge when it becomes available. Ashton-Tate says that Version 1.1 will include support for the Ashton-Tate/Microsoft *SQL Server* for OS/2-based networks. The update and the *SQL Server* are promised for release

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LOTUS EDITORIAL EVALUATION
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I am a 1-2-3/Symphony:
☐ Novice ☐ Intermediate ☐ Expert

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Good	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fair	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Poor	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
N/A	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

TELL US HOW WE DID

The editors of *LOTUS* would appreciate your evaluation of the articles in this issue. This is easier than it may appear, and no postage is required.

1 Get the assigned number for each article from the Editorial Evaluation list on the facing page.

2 Find the article's number in the top row of the evaluation section of the card.

3 Circle the number that reflects your evaluation. If an article did not interest you at all, circle number 5.

We encourage you to *comment* on, as well as evaluate, the contents of this issue. Thanks in advance.

EDITORIAL EVALUATION

Your comments about *LOTUS* magazine help us bring you the best editorial product each month. To rate the articles in this issue, scan the list below and refer to the EDITORIAL EVALUATION card on the bottom of the insert to the left. Identify the number corresponding to each article, then circle the number on the card that reflects your rating.

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this spring. Also due then, to purchasers of the Developer's Edition, is a free upgrade with a new *dBase* compiler that produces executable applications that work without a run-time module.

Finally, due by the time you read this is an OS/2 version of *dBase IV* and a separate conversion utility that will convert to *dBase IV* format applications written for the *Clipper*, *Quicksilver*, and *FoxBase+* database-management systems.

—Tom Carlton

Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90502; 213-329-8000. Requires DOS 2.1 or higher for the single-user version, DOS 3.1 or higher for the multiuser version. Runs on an IBM PC, PC XT, PC AT, PS/2, or compatible computer with 640K of RAM and a hard disk. Released 10/88. $795 for *dBase IV*, $1,295 for the Developer's Edition. Owners of *dBase II* or *dBase III Plus* can upgrade for $175 if purchase was made before 2/17/88; *dBase III Plus* owners can upgrade for $30 if purchase was made between 2/17/88 and 10/31/88. Upgrading to the Developer's Edition is an additional $300. 30-day, defective-disk warranty.

CIRCLE 1 ON READER SERVICE CARD

FINANCIAL, ACCOUNTING

Small-Business Series to Control Finances and Inventory

Business Success Programs contains five *1-2-3* templates that help you run a small to medium-size business.

With the cash flow program, you can store and print estimated, actual, and year-end-summary cash flow reports similar to those suggested by the Small Business Administration. The automated-budget program lets you begin in any month to forecast and compare budget variances with actual expenses. The job-cost program lets you estimate and track labor, material, and other expenses. The five-year financial-analysis program provides key calculations such as return on investment, percent of change in sales, debt-to-equity ratio, and aging reports for receivables, payables, and inventory. The inventory-control program helps you maintain your material-turnover objectives by automatically identifying when and how much of each item to order.

Requires *1-2-3* Release 2/2.01 and, depending on the template, takes from 384K to 512K of RAM, including *1-2-3*. $49.95 each or $199.95 for all five, from Strategic Management Systems, 1720 South Bellaire, Suite 802, Denver, CO 80222; 303-756-4273.

CIRCLE 2 ON READER SERVICE CARD

1-2-3 Template Helps You Choose the Right Personal Loan

Loansmart lets you compare loans with fixed and variable interest rates. Doing a loan comparison lets you gauge the financial impact of selling your house in five years or of keeping it much longer. The program lets you produce tables that show the effects of annual and cumulative amortization, cumulative interest expenses, and monthly payments.

Loansmart works with *1-2-3* Release 2/2.01 and runs on the IBM PC, PS/2, and compatible computers with 640K of RAM. It costs $49.95, from Uhimchuk & Assoc., 432 Sid Bickley Rd., Chapin, SC 29036; 803-345-5739.

CIRCLE 3 ON READER SERVICE CARD

1-2-3 Template for Defined-Contribution Plans

Allocate lets accountants and retirement-plan professionals process a company's defined-contribution plan, such as profit-sharing, or money-purchase plans. You can choose to integrate social security contributions or not. The program, designed for companies with up to 100 employees, allocates funds from separate or comingled plans for correct reporting to the IRS. *Allocate* has drivers for the Epson and Okidata dot-matrix printers and Hewlett-Packard LaserJet printers.

Requires *1-2-3* Release 2.01, DOS 2.1 or higher, and 640K of RAM. $195, from Accountants' Quality Software, 1010 Depot Hill Rd., Suite 203, Broomfield, CO 80020; 303-465-4669.

CIRCLE 4 ON READER SERVICE CARD

Add-In Links 1-2-3 and Accounting Package

AccLink lets you analyze data and create reports from within *1-2-3*, using data

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from Computer Associates' accounting packages *Accpac Plus* and *Easy Business Systems*. The program lets you consolidate figures from several companies and translate among different currencies. You can prepare reports for divisions, departments, or the entire corporation and make multiyear corporate-data comparisons.

An *AccLink* template lets you calculate 20 key operating ratios spread over four areas: the management of funds, such as fixed assets and turnover; solvency indicators, such as debt-to-equity and total debt; liquidity indicators, such as current and quick ratios; and profitability indicators, such as profit margin and return on equity.

Requires *1-2-3* Release 2/2.01, any version of *Accpac Plus* or *Easy Business Systems*, a hard disk, and 512K of RAM. $499.95, from Synex Systems Corp., 800-1176 West Georgia St., Vancouver, B.C., Canada V6E 4A2; 800-663-8663, in Canada 604-688-8271.

CIRCLE 5 ON READER SERVICE CARD

Plan Your Tax Strategy

Taxplan91 helps you determine the tax consequences of various investment strategies through 1991 and then graph the results. There are special worksheets for figuring IRAs and passive-activity data.

Runs with any version of *1-2-3* or by itself. Manufacturer recommends 512K of RAM. $70, from Tax Help, Box 2257, Peabody, MA 01960; 508-535-0688.

CIRCLE 6 ON READER SERVICE CARD

FORMS, PRINTING HELP

No-Fail Desktop Publishing for Common Office Documents

Laser-Ready provides a set of templates to help you print business letters, envelopes, invoices, mailing labels, business cards, overhead transparencies, and other documents. Choose among six styles of business letters and four kinds of overheads, and the program issues the laser-printer instructions to print them. You can print PRN files up to 219 characters wide either vertically or horizontally. The layout designs let you coordinate the look of your business letters, cards, and resumés.

Runs on the IBM PC, PS/2, and compatible computers with 512K of RAM, a graphics card, a hard disk, and with any Hewlett-Packard LaserJet Series II or compatible printer. $99.95, from Mind Path Technologies, 12700 Park Central Dr., Suite 1801, Dallas, TX 75251; 214-233-9296.

CIRCLE 7 ON READER SERVICE CARD

Fill Out and Print Forms

FormFiller lets you fill out any form you can put through your printer. The software justifies each form entry to the left or center of each blank. It can also perform calculations involving more than one field on the form. You can import DIF and delimited ASCII files and control the incoming layout. The program lets you look up figures in a table, sum columns, figure percentages, calculate subtotals and totals, and report the answers on the form. You can control the sequence of fields (blanks) to be filled, make some entries conditional upon others, and create your own error messages.

Uses 384K of RAM and runs on the IBM PC, PS/2, and compatible computers. Works with most printers and tractor- or single-sheet-fed forms. $149, from Bloc Publishing Corp., 800 SW 37th Ave., Suite 765, Coral Gables, FL 33134; 800-888-BLOC, in Fla. 305-445-0903.

CIRCLE 8 ON READER SERVICE CARD

WORKSHEET UTILITIES

Add-in Helps Prevent Accidental Data Loss

4-Sure is a *1-2-3* add-in that's especially useful if you're new to computers or if you don't save your work frequently. The program temporarily takes over whenever you issue a command that could cause you to lose your work. If you enter the Quit, File Retrieve, Worksheet Erase, or System command, the software checks the worksheet for changes made since the file was last saved. If it detects unsaved changes, the program asks you to confirm that you really want to discard the changes. The program also gives you the option of automatically saving your work to a hard-disk file periodically.

Uses 15K of RAM and requires *1-2-3* Release 2/2.01 and, for optional back-up, a hard disk. $39.95, from Isogon Corp., 330 Seventh Ave., New York, NY 10001; 800-662-6036.

CIRCLE 9 ON READER SERVICE CARD

Write Your Own @Functions

3-2-1 Gosub is a *1-2-3* add-in that lets you create subroutines and loops and manipulate arrays in a worksheet. You can build your own @functions that are more powerful and use less memory than the equivalent macros. You can instruct the @functions you create to invoke @functions from other manufacturers' add-ins. The program comes with 35 @functions that perform a variety of tasks, including converting metric to English equivalents and multiplying matrices.

Uses 3K of RAM and requires *1-2-3* Release 2/2.01. $99.95, from Frontline Systems, P.O. Box 7408, San Francisco, CA 94120; 800-451-0303 ext. 55, in Calif. 916-677-7171.

CIRCLE 10 ON READER SERVICE CARD

Pinpoint Differences Between Two Similar Spreadsheets

Check It Out lets you examine two spreadsheets simultaneously to compare their formulas, values, labels, and worksheet settings. The program issues comparative status reports on named graphs, range names, and cell formats. The program runs with all versions of *1-2-3*, all versions of *Symphony*, and compatible spreadsheets.

The utility uses 128K of RAM and runs on the IBM PC, PS/2, and compatible computers with DOS 2.1 or higher. It costs $59.95, from Simon & Schuster Software, 200 Old Tappan Rd., Old Tappan, NJ 07675; 800-624-0023, in N.J. 800-624-0024.

CIRCLE 11 ON READER SERVICE CARD

PRINTER UTILITIES

Take Advantage of Your Printer's Maximum Resolution

PrintaPlot makes your printer output look like high-resolution plotter output. The program works with any application that has Hewlett-Packard Graphics Language drivers, which includes most graphics, desktop-publishing, CAD, CAE, and business-presentation packages, and with most printers. You get 300-dpi resolution from laser and ink-jet printers and 360-by-360 dpi resolution from 24-pin dot-matrix printers.

You can select a variety of pen widths and colors or gray-scale shades. The program lets you scale a graphic from 1% to

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CIRCLE 12 ON READER SERVICE CARD

Make Your Software PostScript-Compatible

Trading Post lets you print text files from *1-2-3, Symphony, dBase*, and most other applications on *PostScript*-compatible printers from Apple, QMS, NEC, Texas Instruments, and others. This means you can print spreadsheets on an Apple LaserWriter. You cannot print boldface, italic, and other attributes, although you can print sideways. It is compatible with printer-sharing devices and with most networks.

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Uses 7K of RAM and runs on the IBM PC, PS/2, and compatible computers. $79, from LaserTools Corp., 3025 Buena Vista Way, Berkeley, CA 94708; 415-843-2234.

CIRCLE 13 ON READER SERVICE CARD

MORE UTILITIES

File Recovery Featured Among 20 Utilities

Lightning Utilities provides 20 programs that let you find or view files; organize, optimize, and back up your disks; capture screens; turn off your monitor; change screen colors, and more. But the heart of the program is its file-recovery feature. It lets you repair hard or floppy disks that have read/write errors. You can recover files that are unrecognizable to DOS. For instance, if you have a DOS message "Invalid drive specification," the utility called *Fixit* will let you display the file-allocation table, display the contents of individual files, and indicate to you any areas of a file that it can't read.

Runs on the IBM PC, PS/2, and compatible computers with 256K of RAM. $79, from LightningWord Corp., 1601 Civic Center Dr., Santa Clara, CA 95050; 800-426-4381, in Calif. 408-241-1990.

CIRCLE 14 DN READER SERVICE CARD

32 Megabytes of Expanded Memory for 1-2-3, Symphony

SoftBytes 386 remaps video and ROM BIOS memory, allowing a '386-based computer to run up to 40% faster and extending conventional memory by 64K to 96K.

The program lets you load and run most terminate-and-stay-resident programs from reserved memory (the 384K above 640K of RAM). An LIM-EMS 4.0 emulator lets *1-2-3* and *Symphony* use 32 megabytes of expanded memory.

SoftBytes 386 uses 3K of RAM and runs on the IBM PS/2 models 70 and 80 or any 80386-based computer with 500K of extended memory. It costs $69.95, from Microteknology/MRPC, 10951 Sorrento Valley Rd., San Diego, CA 92121; 800-876-0400.

CIRCLE 15 DN READER SERVICE CARD

Display More of Any Program on Your Screen

UltraVision lets you instruct your EGA card to compress the type on your screen, change the display fonts, and change screen colors. You can see 132 characters and 43 rows in any application program. The software improves your screen resolution and lets you choose from 20 type fonts, which you can mix and match as you please.

Uses 18K of RAM and runs on the IBM PC and compatible computers with an EGA card and monitor. $119.95, from Personics Corp., 63 Great Rd., Maynard, MA 01754; 800-445-3311, in Mass. 508-897-1575.

CIRCLE 16 DN READER SERVICE CARD

Squeeze Files, Recover Data, and Print Sideways

Tight'N Up (100K of RAM, $49.95) lets you compress hard- and floppy-disk files by as much as 90%. *Rescue Me* (128K of RAM, $59.95) can restore all data deleted within the same memory session or tell you what's missing. *Horizontal Plus* (128K of RAM, $49.95) lets you print sideways, has a font generator, and includes 12 fonts.

The utilities run with any release of *1-2-3* on the IBM PC, PS/2, and compatible computers. They are from Simon & Schuster, 200 Old Tappan Rd., Tappan, NJ 07675; 800-624-0023, in N.J. 800-624-0024.

CIRCLE 17 DN READER SERVICE CARD

OTHER SOFTWARE

Monthly Support Service for All Lotus Products on CD-ROM

Every month, *Lotus Prompt CD* provides you with answers from Lotus Development Corp.'s technical support staff to users' questions—answers that aren't easy to find in product manuals. All releases of Lotus products are covered. The 2,600 technical-support notes answer such questions as "How do I round to the nearest nickel in *1-2-3*?" or "How do I change custom colors in *Agenda*?" New support notes are added each month.

The program also contains the latest news from Lotus, including information about *1-2-3* Release 3; demonstrations of the latest product releases; complete product documentation for *1-2-3* Release 2/2.01 and *Agenda* Release 1; a list of Lotus-authorized training centers; a guide to other manufacturers' products that work with Lotus products; the most recent 12 months of *LOTUS* magazine, with all back issues to be added as soon as possible; tips from the *Lotus Prompt Quarterly* about using Lotus products; device drivers; add-ins such as *Speedup* and *Learn*; and Lotus press releases since January 1987.

During the first quarter of 1989, Lotus will add an electronic bulletin board service with daily updates about Release 3. This information will be compiled for the monthly CD-ROM release.

Runs on the IBM PC XT, PS/2, and compatible computers with 640K of RAM, a hard disk with 500K of available memory, DOS 3.1 or higher, and a CD-ROM drive that reads High Sierra disk format and Microsoft MS-DOS CD-ROM Extensions. $995 for a one-year subscription, from Lotus Development Corp., 55 Cambridge Pkwy., Cambridge, MA 02142; 800-367-6100.

CIRCLE 18 DN READER SERVICE CARD

Optimize Manufacturing Production with PC Modeling

Manuplan II lets you analyze planning and production for manufacturing operations from within *1-2-3*. As an alternative to factory simulation, the program features rapid modeling based on representative data to help you analyze all fac-

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ets of your current operations. You can explore what-if scenarios with varying, interdependent details and receive answers in less than two minutes.

Runs with *1-2-3* Release 2/2.01, 640K of RAM, and a hard disk. $4,500, from Network Dynamics, 128 Wheeler St., Burlington, MA 01803; 617-270-4120.

CIRCLE 19 ON READER SERVICE CARD

Scan Images into Graphics and Desktop-Publishing Programs

ScanMan lets you scan text and graphics from photos, business cards, drawings, and other printed material into programs that read TIFF and PCX file formats such as *PageMaker, Ventura Publisher*, and *PC Paintbrush*, and into the *Microsoft Windows* clipboard. It has a four-inch-wide scanning window. With the *PaintShow Plus Graphics Editor*, which is included with the program, you can rotate, cut and paste, merge, flip, add color to, and edit graphics pixel by pixel. However, you cannot edit text.

Runs on the IBM PC, PS/2, and compatible computers with 384K of RAM for black-and-white images, 640K of RAM for color images, and a graphics card. $299, from Logitech, 6505 Kaiser Dr., Fremont, CA; 800-231-7717, in Calif. 800-552-8885.

CIRCLE 20 ON READER SERVICE CARD

UPGRADES

Program Includes Newest Cash Flow Accounting Rules

Bottomline-V Version 3.1 adds the Statement of Cash Flows, which is required by the Financial Accounting Standards Board, to the program's six modules. The package contains six financial-simulation models and four budget/cash flow statements that run with any version of *1-2-3* and with other popular spreadsheets.

Runs on the IBM PC, PS/2, and compatible computers with 512K of RAM. $595, from Ilar Systems, 334 Baywood Dr., Newport Beach, CA 92660; 800-777-4920.

CIRCLE 21 ON READER SERVICE CARD

Put Scanner, Photo, Video, and PC Images in Your Charts

ImageStation 4.0 lets you create high-resolution graphics, incorporating data from *1-2-3* and *Symphony* worksheets and PIC files and from *Freelance Plus*'s CGM files. The program lets you chart up to 30 data sets with over 30,000 data points per set and to display graphs using real-time data input.

Runs on the IBM PC AT and compatible computers with 640K of RAM and a 20-megabyte hard disk, and a Truevision TARGA 16, Vision Technologies Vision 16, or compatible graphics board. A mouse or a tablet is recommended. $1,800, from Software Clearing House, 895 Central Ave., Cincinnati, OH 45202; 513-579-0455.

CIRCLE 22 ON READER SERVICE CARD

Graphics Utility Adds Compatible File Formats

HiJaak 1.1 works with Hewlett-Packard Graphics Language and fax CCITT Group 3 file formats, as well as with *WordPerfect* 5.0 WPG raster files. The program captures text screens and converts them to either a LaserJet- or *PostScript*-quality font that runs on any printer, retaining all print attributes.

Runs on the IBM PC, PS/2, and compatible computers with 512K of RAM and a hard disk. $99, from Inset Systems, 71 Commerce Dr., Brookfield, CT 06804; 203-775-5866.

CIRCLE 23 ON READER SERVICE CARD

Connect All PCs and Macs, Transfer Files Both Ways

Lap-Link Mac Version 2.0 has all the software and hardware you need to inter-

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Lap-Link Mac uses 256K of RAM on a PC and 128K on a Mac and runs on the IBM PC, PS/2, any Macintosh except the 128, and compatible computers with 512K of RAM. It costs $139.95, from Traveling Software, 18702 North Creek Pkwy., Bothell, WA 98011; 800-343-8080, in Wash. 206-483-8088.

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BOOKS

Instant Access Guide to Lotus 1-2-3, by Nancy Mann, is for beginners. Published 1988, 256 pages, $14.95 in paperback, from Price Stern Sloan Publishers, 360 North La Cienega, Los Angeles, CA 90048; 800-421-0892, in Calif. 800-227-8801.

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1-2-3 QuickStart, developed by Que Corp. Published October 1988, 446 pages, $21.95, from Que Corp., 11711 North College Ave., Carmel, IN 46032; 800-428-5331 ext. 899, in Ind. 317-573-2500.

CIRCLE 26 ON READER SERVICE CARD

Lotus 1-2-3 Tips and Tricks, by Gene Weisskopf. Published July 1988, 396 pages, $21.95, from Sybex, 2021 Challenger Dr., No. 100, Alameda, CA 94501; 415-523-8233.

CIRCLE 27 ON READER SERVICE CARD

Advanced Techniques in Lotus 1-2-3, by E. Michael Lunsford and Peter Antoniak. Published August 1988, 400 pages, $21.95, from Sybex, 2021 Challenger Dr., No. 100, Alameda, CA 94501; 415-523-8233.

CIRCLE 28 ON READER SERVICE CARD

WordPerfect 5: Desktop Publishing in Style, by Daniel Will-Harris, has a chapter on publishing with *1-2-3*. Published 1988, 496 pages, $24.95 in paperback, from Peachpit Press, 1085 Keith Ave., Berkeley, Calif.; 415-527-8555.

CIRCLE 29 ON READER SERVICE CARD

The Book of Fax: An Impartial Guide to Buying and Using Facsimile Machines, by Daniel Fishman and Elliot King, sorts out the issues surrounding this popular new communication medium. Published 1988, 150 pages, $12.95 in paperback, from Ventana Press, P.O. Box 2468, Chapel Hill, NC 27515; 919-942-0220.

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Information for New Products is supplied by the vendors and was up to date as of 12/7/88. Since production specifications change frequently, we recommend that you verify this information with a dealer before making a purchase

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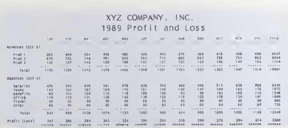
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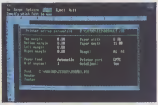

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ESSAY

SO THIS IS COMDEX

BY DANIEL SELIGMAN

THE INTERFACE GROUP INC

What do you get when you cross Disneyland with the high-tech industry? The answer: Comdex, America's hugest computer trade show. Wandering through this Magic Kingdom of high technology are 110,000 computer professionals, many wearing business suits and running shoes, all toting bags filled with product literature and giveaways. Plunk the whole production down amid the shimmering neon of Las Vegas and you get Comdex/Fall '88.

Your essayist got his first exposure to Comdex last November. Unlike most of the throng who poured into town for this event, I was not buying or selling products; I was instead seeking clues to the deeper meaning of the extravaganza, assuming it has any. The first thing I realized was that if I wanted to spend five minutes at each of the 1,700-odd booths, it would take me nearly three weeks of seven-hour days.

Upon getting a show badge, I rushed to the Riviera for the big Microsoft event. Upstairs Bill Gates and company were serving lunch and selling hard. Jeff Sanderson of Microsoft demonstrated the latest whiz-bang capabilities of the still unreleased *Microsoft Word* 5.0. Unfortunately, he hit a wrong key and was soon uttering sentences like: "If we didn't do what we just did, the graph would now be at the bottom of the column." Microsoft's Phil Welt, demonstrating *Excel*, entered a formula in the wrong cell and had to start over. More successful was a dazzling demonstration of a "dynamic data exchange," in which a bar chart kept changing as new stock-price data floated across the screen.

The convention center was colossal, sprawling in all directions. Before getting fully oriented, I saw a huge banner for Dell and rushed over to see what the maker of my own PC, a Dell System 200, was up to. I found I was—whoops—in a deli. It was time to wipe off my glasses and get with it. Inside the main hall, I discovered a mock political convention run by the "WordPerfect Party." Somehow or other, the convention featured a game show in which the delegates won prizes for coming up with the right answers to questions about *WordPerfect*. One "delegate" won applause and computer literature for yelling out "programmable macros." What all this had to do with politics I'm still sorting out.

Comdex/Fall '88 featured lots of highly technical seminars, as well as lots of show biz. Examples of the latter include the goings-on at the IBM booth, where the theme was the Micro Channel architecture (MCA), the marvelous bus that moves data around inside MCA computers. Leaning hard on the metaphor, the pitchman put on a bus-driver's hat and sat down at the wheel, just in front of a video screen that took us whizzing down a highway. Soon we came to a sign on an overpass: "No shortcuts." This seemed to mean that IBM really tried its darnedest.

Wandering on, I was hypnotized by a Groucho Marx imitator telling jokes from the 1930 film *Animal Crackers*. "One morning I shot an elephant in my pajamas. How he got into my pajamas I'll never know." Groucho's problem was to find a graceful transition from the jokes to his spiel about Mannesmann Tally printers. One man's opinion: He did not solve this problem.

The day closed on a surrealistic note at the Toshiba party, held in the Las Vegas Museum of Natural History. The vast, circular room featured giant, moving dinosaurs, and as a fellow from Intel patiently explained to me why his company will never make personal computers, I kept watching *Tyrannosaurus rex* move menacingly toward *Triceratops*.

A memorable couple of hours at Comdex was IBM's invitation-only breakfast for some 1,500 computer dealers at the Tropicana. The show started with an exhibition of computer-generated graphics, accompanied by laser beams shooting all over the Grand Ballroom. This extravaganza was followed by speeches and by the drawing of names of the lucky few who won PS/2 Model 70 computers. The emcee was IBM's Dave Thomas, who managed the introductions almost as well as Johnny Carson. But one senses that Carson's guests might develop more audience rapport than the speaker who talked earnestly about IBM's "AIX–OS/2–SAA strategies."

Also speaking was IBM ally Bill Gates, chairman and CEO of Microsoft, who was there to demonstrate *Excel* running under Presentation Manager. Given the glitches made by Microsoft managers at the company's own show, I watched anxiously to see whether Bill would screw up. As it turned out, everything went smoothly. Maybe that's why he's chairman. ■

Daniel Seligman writes Fortune *magazine's "Keeping Up" column.*

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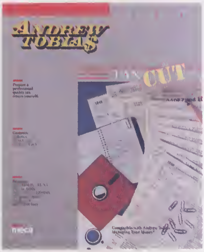

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